PB89-128326

Superfund Record of Decision (EPA Region 5)
Pristine, Ohio, December 1987
First Remedial Action

(U.S.) Environmental Protection Agency
Washington, DC

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EPA/ROD/R05-88/060
December 1987

EPA

Superfund Record of Decision:

Pristine, OH

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Pristine, Inc. site is located in southwestern Ohio in the City of Reading (population 12,843), a suburb of Cincinnati. The site is bordered by residential and industrial areas. Three hundred feet northeast of the site is a residential trailer park. Eight municipal water supply wells serving the citizens of Reading are located approximately 300 feet northwest of the site. In 1974, Pristine, Inc. began liquid waste disposal operations at the site. Prior to 1974, the site was used for the manufacturing of sulfuric acid. In the spring of 1977, Pristine, Inc. obtained a permit to operate a liquid waste incinerator. In April 1979, as many as 8,000 to 10,000 drums and several hundred thousand gallons of bulk liquids were found onsite consisting of acids, solvents, pesticides, PCBs, and other chemicals. Disposal operations were ordered to shut down in September 1981, in accordance with a partial consent order with the State of Ohio. From June 1980 to November 1983, much of the onsite waste was removed in accordance with a Consent Decree between Pristine, Inc. and the Ohio EPA. Wastes stored and subsequently removed from the site during this period included paint sludges, lab packs, flammable solvents, cyanide wastes, pesticides, chlorinated solvent sludge, DDT, "neutralized" acid sludge, PCB-contaminated soils, incinerator ash, and solvent/sludge mixtures. Between March 1984 and July 1984, soil and waste removal
(See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision
Pristine, OH
First Remedial Action - Final
Contaminated Media: gw, sediments, soil, sw
Key Contaminants: benzene, inorganics, metals, organics, PCE, pesticides, VOCs

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 74
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'A/ROD/R05-88/060
.ristine, OH
First Remedial Action - Final

16. ABSTRACT (continued)

activities addressing immediate hazardous site conditions were performed by some of the PRPs. These activities did not address the long-term risks associated with the site. The results of the RI/FS indicated that over 90 compounds were detected in the soil, ground water, surface water, and sediments including: VOCs (PCE, TCE, benzene), organics, inorganics (metals), and pesticides (dioxin in soils and sediments only).

The selected remedial action for this site includes: excavation and onsite consolidation of 1,725 yd^3 of contaminated soils and sediments with in-situ vitrification of an average of 37,700 yd^3 (average of 10 feet across the entire 2.2-acre site) of contaminated soils and sediments followed by putting a vegetative soil cover over the vitrified mass; ground water extraction and treatment using air stripping with carbon off-gas and offsite discharge to a creek; decontamination, demolition, and offsite disposal of all onsite structures in a non-RCRA landfill; installation of a french drain; and implementation of deed and access restrictions. The estimated present worth cost for this remedial action is $17,094,000 with annual O&M of $94,800.

DECLARATION FOR THE RECORD OF DECISION

PRISTINE, INC. SITE
READING, OHIO

PURPOSE

This decision document represents the selected remedial action for the Pristine, Inc. site in Reading, Ohio. It was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Contingency Plan (40 CFR Part 300).

The State of Ohio has been consulted on the selected remedy and has indicated that a letter of concurrence is forthcoming.

BASIS

The selection of remedy is based upon the Pristine, Inc. Site Administrative Record. The attached index identifies the items which comprise this record.

DESCRIPTION OF SELECTED REMEDY

This final source control remedial action consists of the following:

Excavation and onsite consolidation of 1,725 cubic yards of sediment and soil;

In-situ vitrification to an average depth of ten feet across the site;

Installation of a french drain along the eastern site boundary;

Extraction of ground-water from the lower outwash lens/lower aquifer using at least one extraction well;

On-site treatment of ground-water using air stripper with discharge to Mill Creek;

Decontamination of structures followed by removal and disposal at a solid waste landfill; and

Access and deed restrictions, and ground-water monitoring.

ATTENTION

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DIRECT QUESTIONS RESULTING FROM ILLEGIBILITY TO:

U.S. EPA
OSWER - HSCD

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. As mandated by CERCLA as amended by SARA, the remedy satisfies the preference for treatment that reduces toxicity, mobility, or volume as a principal element. Finally, I have determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

12/31/87

Date

Valdas V. Adamkus
Regional Administrator
U.S. EPA, Region V

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
PRISTINE, INC.
READING, OHIO

SITE LOCATION AND DESCRIPTION

The Pristine, Inc. site is located in southwestern Ohio in the City of Reading (population 12,843), a suburb of Cincinnati. The site occupies approximately two acres in the northeast quarter of Section 33, Township 4, Range 1 in Hamilton County, Ohio (Figure 1). The site is bordered by residential and industrial areas (Figure 2). Cincinnati Drum Service, directly west of the site, cleans, reclaims, and recycles steel drums. Carstab Corporation, directly south of the site, manufactures synthetic stabilizers and plasticizers. The immediate eastern limit of the site is bordered by Conrail Railroad right-of-way. Three hundred feet northeast of the site, beyond the railroad, is a residential trailer park. The land to the north is owned by the City of Reading. Eight municipal water supply wells serving the citizens of Reading are located approximately 300 feet northwest of the site.

Mill Creek flows from north to south approximately 600 feet west of the site. The creek is not used as a drinking water source or for recreational purposes although intermittent fishing in the creek has been observed. It discharges to the Ohio River 14 miles downstream. The average yearly precipitation is approximately 40 inches. Approximately six inches is accounted for by recharge to groundwater flow systems.

The Pristine, Inc. site is situated over the buried valley of the Deep Stage Cincinnati River, a glacial-aged river fed by meltwater that eroded several hundred feet into shale and limestone bedrock. Outwash and other glacially derived sediments, which are about 180 feet thick in the vicinity of the site, were subsequently deposited in this valley. The Pristine, Inc. site is situated on a low terrace that is about ten feet higher than the floodplain of Mill Creek, which now drains the valley. The edge of this terrace is marked by an escarpment which coincides with the western border of the site. The Pristine, Inc. site is not located within the 100 year flood plain, or in a wetlands area.

The site geology consists of five distinct soil units (Figure 3), fill, upper lake sediment glacial till, lower lake sediment, and lower outwash deposits. There are two aquifers under the site. The upper aquifer lies within the upper lake sediments and the lower aquifer lies within the lower outwash deposits. Within the upper lake sediments, there are three lenses that are interconnected; the upper, middle, and lower lenses. The upper aquifer consists of three perched water systems flowing within the lenses in different directions moving downward through the till to the lower aquifer (Figure 4). At the eastern edge of the site, the upper aquifer system lies directly on top of the lower aquifer.

The lower aquifer is the source for the regional water supply. The natural regional groundwater flow in the Mill Creek Valley is southward, discharging at the Ohio River. However, groundwater conditions in the lower aquifer system are now controlled by withdrawal for municipal and industrial water supplies and recharge. The groundwater in the lower aquifer under the Pristine, Inc. site is now flowing to the northwest in the direction of the municipal wellfield. The estimated flow velocity in the top 15 feet of the lower aquifer is 2.2 feet per year.

Although several industrial wells are presently being used, there are no domestic wells identified in the area of the Pristine, Inc. site. All potable water is obtained from the Reading municipal system.

SITE HISTORY

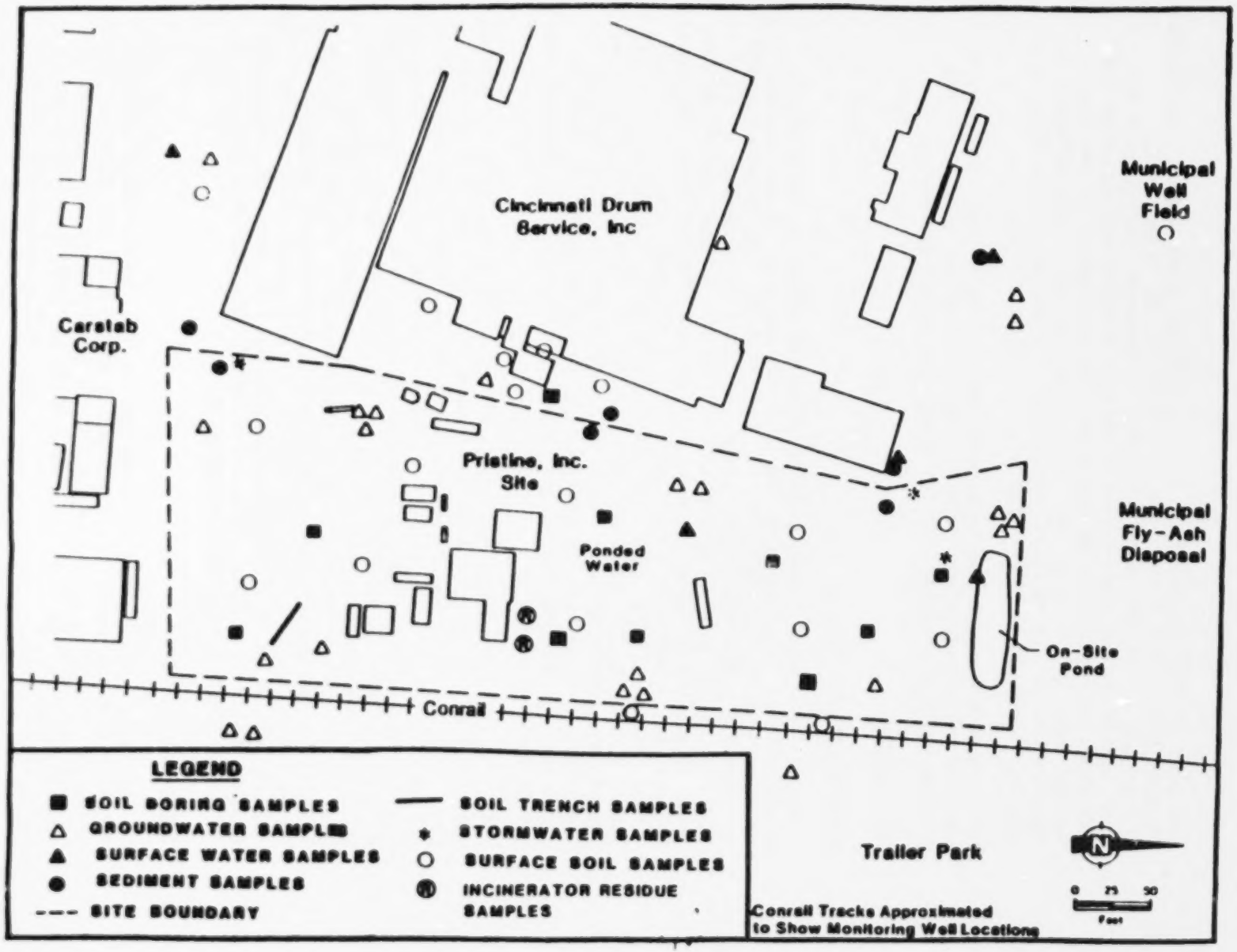
Previous Activities

Pristine, Inc. began liquid waste disposal operations at the site in November 1974. Prior to this, the site had been used for the manufacturing of sulfuric acid. In the Spring of 1977, Pristine, Inc. obtained a permit to operate a liquid waste incinerator. In April 1979, as many as 8,000 to 10,000 drums and several hundred thousand gallons of bulk liquids were on site, consisting of acids, solvents, pesticides, PCBs and other chemicals. Disposal operations were ordered shut down in September 1981, in accord with a partial consent order with the State of Ohio. In August 1982, the Hazard Ranking System (HRS) was used to score the site. In accordance with procedures established under Subpart F, Section 300.66 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the Pristine, Inc. site was added to the National Priorities List (NPL) in December 1982 with a score of 35.25.

From June 1980 to November 1983, much of the waste at the site was removed in accordance with a consent decree between Pristine, Inc. and the Ohio EPA. Some of the wastes stored and subsequently removed from the site during this period included paint sludges, lab packs, flammable solvents, cyanide wastes, pesticides, chlorinated solvent sludge, DDT, "neutralized" acid sludge, PCB-contaminated soils, incinerator ash, and solvent/sludge mixtures. Between March 1984 and July 1984, soil and waste removal activities were performed by some of the potentially responsible parties (PRP) under the authority of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (106(a) administrative order. The cleanup activities undertaken between 1980 and 1984 addressed immediately hazardous site conditions. The activities did not, however, address the long term risks associated with the site.

Current Site Status

In May 1985, a field Remedial Investigation (RI) was initiated to define the magnitude and extent of contamination at the site and characterize the potential threats to public health and the environment. The types of samples taken and their locations are shown in Figure 5. The first



FIG[illegible]5

SAMPLING LOCATIONS

phase of the RI was completed in September 1985 and the RI Report was issued in July 1986.

In Summer of 1986, several data gaps were identified and a second phase of RI fieldwork was planned. However, because site access was not obtained until May 1987, the second phase of fieldwork was not completed until August 1987. The results of the Phase II RI are described in the Addendum to the RI dated December 28, 1987. The Feasibility Study (FS) was completed in November 1987. The FS documents in detail the process followed to develop alternatives and recommend a remedial action for the Pristine, Inc. site.

Site Characterization

The results of the RI/FS indicate that over 90 compounds were detected in the groundwater, soil, sediment, and surface water. These compounds are listed in Table 1. Concentration ranges are displayed for each indicator chemical in Table 2. (Indicator chemicals will be discussed in the summary of the Public Health Evaluation [PHE].) The following sections will address each area of concern.

1. Groundwater

Groundwater in the upper aquifer is contaminated primarily with volatile organic compounds (VOCs) such as benzene, vinyl chloride, tetrachloroethene (PCE), and 1,2-dichloroethane. Semi-volatile compounds (semi-VOCs) and pesticide compounds occurred in relatively lower concentrations. The lower aquifer is contaminated with benzene and 1,2-dichloroethane. There are also elevated levels of lead and fluoride.

Low levels of some of the above mentioned VOCs were detected in the Reading municipal wells. The Agency for Toxic Substances and Disease Registry (ATSDR) reviewed the data and concluded that the presence of the trace levels of VOCs does not present an immediate health concern. However, the presence of VOCs the water indicates that the groundwater quality in the vicinity is compromised and continued monitoring is recommended.

Ingestion of contaminated site groundwater represents a risk ranging from 10^{-1} to 10^{-4} excess lifetime cancer risk under worst-case and most probable scenarios. Excess lifetime cancer risk is the incremental increase in the probability of developing cancer over the background probability (i.e., if no exposure to site contaminants occurred). For example, a 1×10^{-6} excess lifetime cancer risk means that for every one million people exposed to the carcinogen, the average incidence of cancer is increased by one extra case of cancer in a 70 year lifetime.

2. Soil and Sediment

Sediment from the drainage ditches and soil in the upper two feet of the site are contaminated with a variety of VOCs, semi-VOCs, and pesticides. Principal contaminants in surface soils are benzene, dieldrin, and DDT.

TABLE 1

CHEMICALS DETECTED AT THE PRISTINE INC. SITE AND THEIR TOXICITY CONSTANTS

CHEMICAL (CAS NO.)	WATER TOXICITY CONSTANT (LITER/KG)		SOIL TOXICITY CONSTANT (KG/KG)	
	POTENTIAL CARCINOGEN	NON-CARCINOGEN	POTENTIAL CARCINOGEN	NON-CARCINOGEN
Acetone (67-64-1)				
Aldrin (309-00-2)	1.80E+00		9.00E-05	
Aluminum (7429-90-5)				
Aniline (62-53-3)				
Antimony (7440-36-0)				
Arsenic (7440-38-2)	3.71E+00	1.80E+01	1.86E-04	9.00E-04
Barium (7440-39-3)		4.08E+00		2.04E-04
Benzene (71-43-2)	7.43E-03	1.17E-01	3.71E-07	5.85E-06
Benzo (A) anthracene (56-55-3)	6.00E-01		3.00E-04	
Benzo (A) pyrene (50-32-8)	1.43E+01	2.67E+01	7.14E-04	1.33E-03
Benzo (B) fluoranthene (205-99-2)	4.29E+00		2.14E-04	
Benzo (K) fluoranthene (207-08-9)				
Benzo (G,H,I) perylene (191-24-2)				
Benzoic acid (65-85-0)				
Beryllium (7440-41-7)				
Bis (2-chloroethoxy) methane (111-91-1)				
Bis (2-ethylhexyl) phthalate (117-81-7)				
2-Butanone (78-93-3)		7.75E-03		3.87E-07
Butyl benzyl phthalate (85-68-7)				
Cadmium (7440-39-3)		4.45E+00		2.23E-04
Carbon disulfide (75-15-0)		4.24E-01		2.12E-05
Chlordane (57-74-9)	2.37E+00		1.19E-04	
Chlorobenzene (108-90-7)		1.43E-01		7.14E-06
Chloroethane (75-00-3)				
Chloroform (67-66-3)	5.71E-02		2.86E-06	
4-Chloro-3-methylphenol (59-50-7)				
2-Chloroethyl vinyl ether (110-75-8)				
Chromium (7440-47-3)				
Chrysene (218-01-9)	1.43E-01		7.14E-06	
Cobalt (7440-48-4)				
Copper (7440-50-8)		7.14E-01		3.57E-05
Cyanide (HCN) (74-90-8)				
4,4'-DDD (72-54-8)	2.86E-03		1.43E-07	
4,4'-DDE (72-55-9)	1.06E-01		5.43E-06	
4,4'-DDT (50-29-3)	1.62E-01		8.00E-06	
Di-n-butyl Phthalate (84-74-2)		3.81E-02		1.90E-06
1,2-Dichlorobenzene (95-50-1)		5.19E-02		2.60E-06
1,4-Dichlorobenzene (106-46-7)		5.19E-02		2.60E-06
1,1-Dichloroethane (75-34-3)		2.58E-02		1.29E-06
1,2-Dichloroethane (107-06-2)	6.57E-03	1.76E-02	3.29E-07	8.80E-07
1,1-Dichloroethylene (75-35-4)	1.31E-01	3.71E-01	6.57E-06	1.86E-05
trans-1,2-Dichloroethylene (156-60-5)		5.29E-02		2.65E-06
Dichloromethane (75-09-2)		9.20E-04		4.60E-08
1,2-Dichloropropane (78-87-5)		1.00E-01		5.00E-06
Dieldrin (60-57-1)	3.71E+00		1.86E-04	
Diethyl phthalate (84-66-2)		2.67E-04		1.34E-08
Dimethyl phthalate (131-11-3)				
2,4-Dimethylphenol (105-67-9)				
Di-n-octyl phthalate (117-84-0)				
4,6-Dinitro-2-methylphenol (534-52-1)		6.53E-02		3.27E-04

TABLE 1 (CONTINUED)

CHEMICAL (CAS NO.)	WATER TOXICITY CONSTANT LITER/KG		SOIL TOXICITY CONSTANT KG/KG	
	POTENTIAL CARCINOGEN	NON CARCINOGEN	POTENTIAL CARCINOGEN	NON CARCINOGEN
2,6-Dinitrotoluene(606-20-2)		6.02E-01		3.01E-05
Endrin(72-20-8)				
Ethylbenzene(100-41-4)		1.10E-02		5.52E-07
Fluorene(86-73-7)		1.25E+00		6.24E-05
Fluoranthene(206-44-0)				
Heptachlor(76-44-8)	1.03E+00		5.14E-05	
Alpha-Hexachlorocyclohexane (HCH) (319-84-6)	6.03E+00		3.01E-04	
Beta-HCH (319-85-7)	4.86E-02		2.43E-06	
Delta-HCH (319-86-8)				
Gamma-(HCH) Lindane (58-19-9)	4.86E-02		2.43E-06	
Hexachloroethane(67-72-1)	7.71E-03	6.62E-03	3.86E-07	3.31E-07
2-Hexanone(591-78-6)				
Indeno(1,2,3-cd)pyrene(193-39-5)				
Isophorone(78-59-1)				
Lead(7439-92-1)		8.93E-01		4.46E-05
Manganese(7439-96-5)				
Mercury(7439-97-6)		1.84E+01		9.21E-04
2-Methylnaphthalene(91-57-6)				
4-Methyl-2-pentanone(108-10-1)				
2-Methylphenol(95-48-7)		5.97E+00		2.99E-04
4-Methylphenol(106-44-5)		5.97E+00		2.99E-04
Naphthalene(91-20-3)				
Nickel(7440-02-0)		4.26E+00		2.13E-04
Nitrobenzene(98-95-3)				
2-Nitrophenol(88-75-5)				
n-Nitrosodiphenylamine(86-30-6)				
Pentachlorophenol(87-86-5)				
Phenanthrene(85-01-8)				
Phenols(108-95-2)		1.00E-01		5.02E-06
Pyrene(129-00-0)				
Selenium(7782-49-2)		1.05E+02		5.26E-03
Silver(7440-22-4)		2.00E+01		1.00E-03
Styrene				
1,1,2,2-Tetrachloroethane(79-34-5)	4.86E-02	4.55E-01	2.43E-06	2.27E-05
Tetrachloroethylene(127-18-4)	5.14E-03	9.62E-03	2.57E-07	4.81E-07
Thallium(7440-28-0)				
Tin(7440-31-5)				
Toluene(108-88-3)		5.20E-03		2.60E-07
Total PCBs	1.06E+00		5.29E-05	
Total xylenes				
1,2,4-Trichlorobenzene(120-82-1)		2.14E-01		1.07E-05
1,1,1-Trichloroethane(71-55-6)		7.33E-04		3.67E-08
1,1,2-Trichloroethane(79-00-5)	8.57E-03		4.29E-07	
Trichloroethylene(79-01-6)	5.14E-03	1.05E+00	2.57E-07	5.26E-05
2,4,6-Trichlorophenol(88-06-2)	2.29E-03		1.14E-07	
Vanadium(7440-62-2)		1.43E-01		7.14E-06
Vinyl acetate(108-05-4)				
Vinyl chloride(75-01-4)	4.57E-03	8.77E-02	2.29E-07	4.39E-06
Zinc(7440-66-6)		1.07E-01		5.33E-06

NOTE: Scientific notation (such as 2E-06) is a shorthand way of indicating decimal places, (i.e., the size of a number). A negative exponent indicates that the decimal should be moved the specified number of places to the left (i.e., 2.4E-03 = 0.0024), while a positive exponent indicates the number of places the decimal should be moved to the right (i.e., 2.4E-03 = 2,400).

TABLE 2

RANGE OF CHEMICAL CONSTITUENTS DETECTED AT PRISTINE, INC. IN PPB

CHEMICAL CONSTITUENTS	SOIL AREA SAMPLES (Surface)	SOIL TRENCH SAMPLES (Subsurface)	SOIL BORING SAMPLES (Subsurface)	MONITORING WELL SAMPLES (Upper Aquifer)	MONITORING WELL SAMPLES (Lower Aquifer)	WATER SUPPLY SAMPLES (Lower Aquifer)	SURFACE WATER SAMPLES	SEDIMENT SAMPLES	STORM-WATER SAMPLES
Organic Compounds									
VINYL CHLORIDE	0	0	0	0-830	0	0	0	0	0
TETRACHLOROETHENE	0-120,000	0	0-430	0-7,500	0	0	0-250	0-504	0
BENZENE	0	0-1,200	0-27,000	0-34,000	0-8	0-9.5	0-9.3	0-12	0
1,2 DICHLOROETHANE	0-110	0-3,500	0-57,000	0-150,000	0-780	0-170	0-6,200	0-2,400	0
PHENOL	0-11,900	410-6,200	0-18,000	0-4,500	0	0	0-230	0-987	0
BENZO(a)PYRENE	0-640	0-200	0	0	0	0	0	0	0
DIELDRIN	0-1,500	0	0-74	0	0	0	0	0-75	0-0.2
4,4' DDE	0-3,000	0	0-370	0	0	0	0-0.86	0-1,800	0-0.06
4,4'-DDD	0-2,400	0	0-2,100	0-0.14	0	0	0-0.78	0-1,700	0-0.24
4,4'-DDT	0-10,000	0	0-18,000	0	0	0	0-1.82	0-21,000	0-1.5
Inorganic Compounds									
CADMIUM	0-51,000	0	0-8,500	0-39	0-9.4	0-6.44	0-136	0-45,000	6.1-20
FLOURIDE	202,000-470,000	NA	0-476,000	170-27,000	100-2,000	0-400	0-3,400	NA	820-2,000
LEAD	23,000-4,000,000	10,000-77,000	0-258,000	0-178	0-148	0-4.6	0-383	0-2,410,000	59-768
MERCURY	0-8,200	0-160	0-980	0-0.44	0-0.021	0-0.1	0-1.1	0-15,000	0-6.6

A concentration of zero(0) indicates the compound was not detected at the Contract Laboratory Program Detection Limit.

NA - Not Analyzed

Note: There were over 90 compounds detected at the site. These are the "indicator chemicals" listed in this table.

2,3,7,8-TCDD (dioxin) and 17 dioxin and furan isomers were found in the surface soil around the incinerator and in the ash in the part per trillion range. (2,3,7,8-TCDD was also found in the laboratory blank.) Several of these isomers were detected offsite in the area of the Reading wellfield. This contamination does not appear to be from the Pristine, Inc. site. The dioxin and furan compounds found onsite were strictly associated with the ash from around the area of the incinerator and were found no place else. The source of these compounds in the vicinity of the wellfield is unknown.

Subsurface soil contained VOCs [benzene and tetrachloroethene, 1,2-dichloroethane and trichloroethene (TCE)]. Several of these contaminants were found at a depth of 14 feet. There were also elevated levels of cadmium, lead, mercury and zinc.

Contact with and incidental ingestion of the contaminated soil constitutes a hazard of 10^{-4} to 10^{-6} excess lifetime cancer risk. Exposure to the dioxins and furans will increase the incremental excess lifetime cancer risk by 2×10^{-6} to 1×10^{-8}.

If the site soils are disturbed (in absence of any remediation) volatilization of organic chemicals will occur and the excess lifetime cancer risk will increase via inhalation.

3. Surface Water

Surface water was contaminated with VOCs, semi-VOCs and pesticides (1,2-dichloroethane, phenol, and DDT). There were also elevated levels of inorganic compounds (cadmium, chromium, and mercury).

The potential risk posed by inhalation or skin contact with these levels of contaminants is low (less than 10^{-6} excess lifetime cancer risk) using the assumptions in the PHE.

SUMMARY OF PUBLIC HEALTH EVALUATION

A baseline public health evaluation (PHE) was performed as part of the RI to evaluate the potential risk to public health and the environment associated with the releases or potential releases of hazardous substances from the Pristine, Inc. site.

The PHE describes the selection of indicator chemicals, i.e., the subset of chemicals detected at Pristine, Inc., that will be used in the risk assessment. The PHE evaluates the potential for risk from the site and the surrounding area, both now and in the future, assuming that current use patterns remain unchanged, and the risks posed by the site in the future if the site and surrounding areas are redeveloped or otherwise reused. The exposure pathways, which delineate the possible routes by which exposure could occur, the estimated concentration of the contaminants at the exposure points, and the potential effect of exposure via each of the potential pathways were discussed.

Data presented in the RI report indicated that over 90 chemicals have been detected at Pristine, Inc., in groundwater, surface water, storm water, surface and subsurface soils, and sediments. Because of the large number of chemicals, it was necessary to select a manageable subset for use in the risk assessment. The methodology used to select this subset was done in accordance with the Superfund Public Health Evaluation Manual (U.S. EPA 1986). The chemicals selected, called indicator chemicals, are chosen so that they represent the most toxic, mobile, and persistent chemicals at the site, as well as those present in the largest amounts (i.e., the "highest risk" chemicals). The indicator chemicals provide a basis to evaluate the threat to human health, welfare, and the environment from the site. The selected indicator chemicals are shown in Table 2.

A "current use" risk assessment and "future reuse" risk assessment was done on all complete exposure pathways using exposure point concentrations of the indicator chemicals. A pathway is considered complete if all the following elements are present: (1) a source and mechanism of chemical release to the environment, (2) an environmental transport medium for the released chemical, (3) a point of potential exposure by the receptor with the contaminated medium, and (4) a route of exposure. The current use potential exposure pathways included dermal contact and incidental ingestion of the soil, ingestion of the groundwater contribution from Pristine, Inc. to the Reading water supply wells sometime in the future, and inhalation of dust and of volatile chemicals emitted from soils and surface water. Although groundwater contamination is presently migrating from the site, the magnitude and extent of offsite contamination from the site has not been determined. Therefore, assumptions were made regarding the migration. Included in the groundwater exposure pathway was consideration of future contaminant migration from the site. The potential pathways considered if the site was reused were exposure via ingestion of groundwater on the site and dermal contact and incidental ingestion of water in Mill Creek that had been contaminated by storm water runoff. Table 3 summarizes the exposure pathways considered in the PHE. Also included in the table are potentially exposed populations, factors affecting exposure, and the likelihood exposure could occur.

The excess lifetime cancer risk level for each complete exposure pathway is listed in Table 4. Current conditions at the site pose a relatively low hazard via the inhalation route. Contact with the contaminated soil constitutes a hazard assuming the length of exposure is on the order of several years and occurs for several hours a day during good weather as appears likely at this site under current use conditions. Ingestion of groundwater appears to be the exposure pathway that poses the greatest risk in that (1) groundwater contamination is considered likely to occur at the Reading wellfield in the future if current pumping rates at this wellfield remain constant and (2) groundwater at the site would pose risks to future potential users.

For complete details, Chapter 5 of the Remedial Investigation should be consulted (July 1986, Camp, Dresser and McKee, Inc.).

TABLE 3

POTENTIAL EXPOSURE PATHWAYS FOR THE PRISTINE SITE
AND SURROUNDING AREA UNDER CURRENT CONDITIONS

Exposure Medium	Release Mechanism	Exposure Point/ Exposed Population	Potential Exposure Route	Pathway Complete?
Soil	Contact with contaminated surface soil	Humans entering the site	Dermal contact, incidental ingestion	Yes
Air	Volatilization from contaminated surface soil and water, generation of dust	Humans entering or living near the site	Inhalation	Yes
Groundwater	Contamination of drinking water wells	Community serviced by the water supply	Ingestion, dermal contact, inhalation	Yes
Surface water	Contamination of surface water via surface runoff from site or drainage ditches	Surface ponds, ditches, and streams	Dermal contact, ingestion	No

Table 4

Potential Carcinogen	Exposure Point	Incremental Lifetime Cancer Risk	
		Most Probable Case	Worst Case
Benzo(a)pyrene	soils; current use:	1.6×10^{-8}	1.4×10^{-6}
Dieldrin	incidental ingestion	1.5×10^{-6}	3.1×10^{-4}
Total		1.5×10^{-6}	3.1×10^{-4}
Benzene	groundwater; current	3.7×10^{-6}	6.2×10^{-3}
Vinyl chloride	use; incidental inges-	1.1×10^{-4}	6.7×10^{-3}
Tetrachloroethene	tion*	2.2×10^{-7}	5.9×10^{-5}
Total		1.1×10^{-4}	1.3×10^{-2}
Benzene	groundwater; potential	3.1×10^{-5}	5.0×10^{-2}
Vinyl chloride	future use;	9.2×10^{-4}	5.4×10^{-2}
Tetrachloroethene	incidental ingestion**	1.9×10^{-6}	5.0×10^{-4}
		9.5×10^{-4}	1.0×10^{-1}
Benzo(a)pyrene	surface water and soil;	4.2×10^{-18}	1.4×10^{-17}
Benzene	current use; volatilization	1.3×10^{-9}	1.1×10^{-7}
Dieldrin	and inhalation	3.8×10^{-16}	6.4×10^{-15}
Tetrachloroethene		3.3×10^{-11}	1.3×10^{-11}
Total		1.3×10^{-9}	1.1×10^{-7}

* This scenario assumes a radial percentage (12%) of groundwater from the Pristine site will affect the wellfield using the current pumping rates in the area.

** This scenario assumes a private well is installed directly offsite.

COMMUNITY RELATIONS

During the active life of the facility, numerous complaints were made by residents living in an adjacent trailer park and by nearby industry regarding smoke, odors and general dissatisfaction with the incinerator operation. No local citizen group has been formed and there has been little citizen activity or interest since the facility closed.

A public meeting was held to kick off the RI/FS. Because the degree of public interest in this site appeared to be low , U.S. EPA decided that there was no need for a meeting following the RI. U.S. EPA met with the City officials to brief them on the results of the RI and fact sheets were mailed to all on the mailing list.

A public meeting was held on December 3, 1987 to discuss the public comment draft FS. The public comment period was originally established between November 13 and December 4, 1987. On November 24, 1987, U.S. EPA, in response to a request by PRPs, extended the public comment period to December 11, 1987. The attached responsiveness summary addresses specific questions and comments raised at the December 3, 1987 meeting and during the public comment period.

ENFORCEMENT

U.S. EPA has identified approximately 150 PRPs for the Pristine, Inc. site. U.S. EPA identified the PRPs on the basis of Pristine, Inc. records, governmental records, and responses to information requests submitted pursuant to Section 104(e) of CERCLA.

CERCLA Section 104(e) information requests were sent to all known PRPs in 1985 and 1986. U.S. EPA has compiled the site records and information request responses into a transactional data base (TDB). Also, U.S. EPA compiled a volumetric ranking of PRPs based on the TDB, and sent the ranking to the PRPs in November 1987.

A PRP Steering Committee was established in March 1987. The Steering Committee and is very active in the enforcement process. U.S. EPA has held extensive discussions with the PRP Steering Committee and has provided them with the TDB and other technical information as requested.

On November 23, 1987, Special Notice Letters pursuant to Section 122(e) of the Superfund Amendments and Reauthorization Act (SARA) of 1986 were sent to all PRPs. The deadline for receipt of a "good faith offer" to conduct the remedial design and remedial action is January 27, 1988. U.S. EPA is currently negotiating with the PRPs, giving them the opportunity to conduct the remedial design and remedial action discussed in this Summary of Remedial Alternative Selection and the Record of Decision.

ALTERNATIVES DEVELOPMENT

Remedial Action Goals

In evaluating the findings of the RI and PHE, U.S. EPA developed and analyzed alternatives in a manner consistent with NCP. Remedial action goals were developed based on the results of the RI and PHE. The general goal for all environmental media (soil, groundwater, and surface water) is to provide adequate protection of public health and the environment from inhalation, adsorption, and ingestion of hazardous substances. As more information was obtained, these remedial action goals were refined and more specifically defined for each environmental medium.

Remedial Response Actions/Technologies

Once the remedial action goals were developed, general remedial response actions, intended to meet the remedial action goals and address the site-specific characteristics of the contaminated media, were developed. Then, a complete array of technologies was identified and screened to produce a condensed list of applicable remedial technologies that may be suitable for the control of the contaminated media at the Pristine, Inc. site.

Assembly and Initial Screening of Alternatives

All applicable remedial technologies were assembled into alternatives to address the overall contamination at the site. There were 64 such alternatives. These were subjected to an initial screening to reduce the list of potential remedial action alternatives for detailed analysis. The criteria used to screen these assembled alternatives were effectiveness, implementability, and cost. Alternative components that were eliminated as a result of this screening process include off-site incineration, groundwater treatment at a RCRA or POTW facility, and off-site RCRA disposal of contaminated structures. The alternative components that were carried through to detailed analysis include:

Remediation of soils -

- Disposal of soils in off-site RCRA land disposal facility;
- Incineration of soils;
- Vitrification of soils;
- Disposal of soils in an onsite RCRA landfill;

Remediation of groundwater -

- Extraction and onsite treatment of groundwater;

Remediation of existing structures -

- o Decontamination and disposal of structures in an offsite solid waste landfill.

- o Demolition and disposal of structures onsite.

These seven components made up the alternative array that was further developed during the detailed analysis.

Detailed Description of Assembled Alternatives

Prior to the description of the assembled alternatives, the basis for the remediation of contaminated media will be discussed. This includes: quantities of soil to be remediated, the volume of groundwater to be extracted, the extraction methods to be used, and time to implement the cleanup of the groundwater.

Soil Analysis

The soil analysis assessed the vertical and horizontal distribution of soil contaminants and the relative risk associated with the contaminants. The soil analysis, using the information produced in the PHE, determined the methods used to derive target soil concentrations associated with a target risk due to direct contact and the acceptable residual levels of chemicals in the soils.

The RI revealed that a large number of contaminants were present in the surface soils, trenches, and soil borings. As part of the PHE, a subset of these chemicals (indicator chemicals) were selected to evaluate the potential risks to human health from the Pristine, Inc. site. The Superfund Public Health Evaluation Manual (EPA 1986) recommends the re-evaluation of the indicator chemicals for the FS to ensure that all classes of chemicals are considered and can therefore be evaluated as to the applicability of the remedial options considered. Additionally, the manual advises that the initial focus of the evaluation be on the potential carcinogens since they will generally drive the final design.

In this case, 11 compounds were chosen based on frequency, concentration and potential threat. The 11 compounds were aldrin, benzene, chloroform, DDT, 1,2-dichloroethane, 1,1-Dichlorethene, dieldrin, PAHs, 2,3,7,8-TCDD (Dioxin), tetrachloroethene, and trichloroethene.

Based on these 11 compounds, and a cumulative target risk level of 10^{-6}, the resulting apportioned (individual) target risk level of 9.1×10^{-8} for each potential carcinogen was calculated. Once the target intake was calculated, the corresponding individual intake concentration could be calculated using the following formula:

Potential Carcinogenic Risk = (Chronic Daily Intake) (Potency Factor)

The risk was based on exposure to contaminated soil by direct contact and incidental ingestion. Table 5 presents the chronic daily intake for each of the compounds of concern.

Table 5

TARGET SOIL CONCENTRATIONS
PRISTINE, INC. SITE
BASED ON CUMULATIVE 10^{-6} INCREMENTAL LIFETIME CANCER RISK

Chemical	Target Intake Concentration in Soil (ug/kg)
Aldrin	15
Benzene	3182
Chloroform	2043
DDT	487
1,2-Dichloroethane	1818
1,1-Dichloroethene	285
Dieldrin	6
PAHs	14
2,3,7,8-TCDD (Dioxin)	0
Tetrachloroethene	3244
Trichloroethene	15,041

A remediation strategy was developed to remediate all soils which contributed to a 10^{-6} cancer risk based on the calculated daily intake. It was determined that, to reduce the risk associated with a 10^{-6} target cleanup level based on direct contact and incidental ingestion only, it will be necessary to remediate 7,125 cubic yards of soil at the site. (The FS used the Volume 8,225 cubic yards of soil. After publication of the FS, the volume was recalculated. This change should not significantly affect the cost and will not affect the comparative analysis since all alternatives have been made consistent with this new volume.) Concentrations of aldrin, benzene, DDT, 1,2-dichloroethane, dieldrin, tetrachloroethene and PAH are greater than the target risk concentrations listed Table 5. Dieldrin, DDT, and benzene, dominate soil remediation strategy. Removal of 1 foot of soil over the area of the site will eliminate the risk associated with direct contact and incidental ingestion of dieldrin, DDT, 1,2-dichloroethane, tetrachloroethylene, aldrin and PAHs. This represents a volume of 3598 cubic yards of soil. The area to a depth

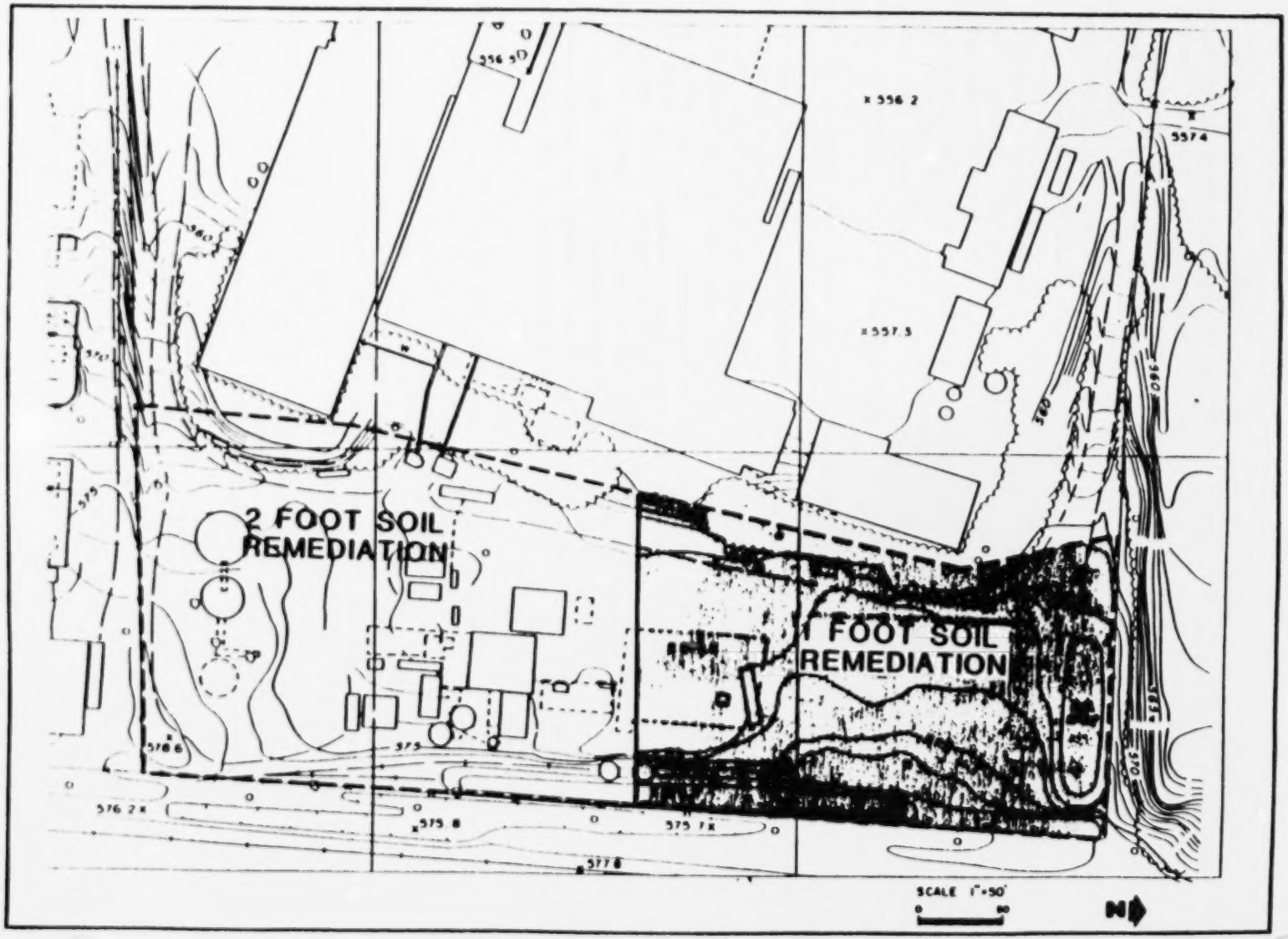
of two feet as shown in Figure 6 shows the area that needs to be remediated based on ingestion of benzene. This represents a volume of 1,799 cubic yards. Sediment samples are defined as contaminated media based on concentrations of aldrin, DDT, dieldrin, PAHs, and 1,2-dichloroethane. The volume of contaminated sediments is estimated to be 600 cubic yards. Subsurface soil in the magic pit area are also defined as contaminated based on the concentration of 1,2-dichloroethane. The volume of soil remediation necessary at the magic pit is calculated to be approximately 1,125 cubic yards. Remediation Strategy I includes a combined volume of 7,125 cubic yards of contaminated media. This soil removal (7,125 cubic yards) strategy addresses only the direct contact threat. Soil contamination remains at the site at depth. Wastes can potentially leach from the soil and migrate downward through the middle and lower lenses, and into the lower aquifer.

A second soil removal strategy was developed which would eliminate both the risk associated with adsorption and ingestion of soils and ingestion of groundwater contaminated through leaching from the soil. This second strategy was developed as an alternative such that the residuals would pose no direct contact threat nor would the residuals impact the groundwater. This strategy was also developed to meet the intent of the Land Disposal Restrictions and Cleanup Standards.

Residual contamination remaining in the soil will, over time, leach into the groundwater. A model was developed to predict contaminant concentrations in groundwater at the Pristine, Inc. site through leachate produced from the residual soil contamination. This model is conservative in that it assumes that all of the contamination reaches the lower aquifer and is only diluted with infiltrating rainwater.

The model assumes that 15 percent of the rainfall at the site will infiltrate the site and absorb contaminants from the soil based on equilibrium soil-water partitioning. The infiltrating rainwater will act to dilute and transport the mobilized contaminant. The model assumes an

FIGURE 6



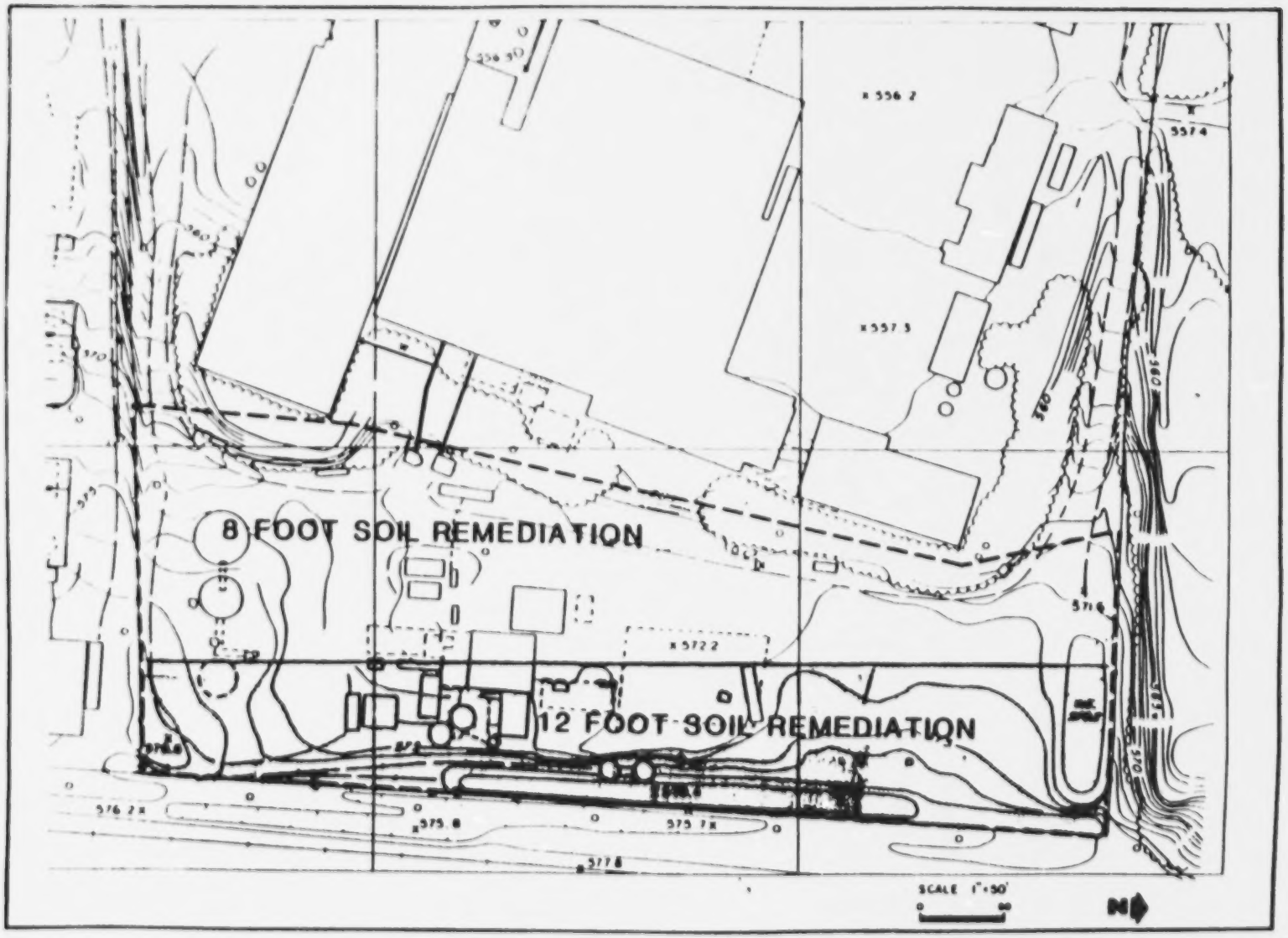
SOIL REMEDIATION STRATEGY T

Table 7

TARGET SOIL CONCENTRATIONS WITH
PREDICTED GROUNDWATER CONCENTRATIONS AT MCLS

Indicator Chemical	Target Soil Concentration (ug/kg)
Benzene	116
1,2-Dichloroethane	19
Trichloroethene	175

FIGURE 7



SOIL REMEDIATION STRATEGY II

equilibrium partitioning of the contaminant between the soil and the soil pore water. The model does not account for attenuation of the contaminants in the unsaturated zone. It further assumes that all of the contamination reaches the lower aquifer. Since the upper and lower aquifer are connected, this assumption is realistic. Once the infiltrating water reaches the lower aquifer, it is further assumed that it will mix completely with the groundwater below the site, resulting in an equilibrium groundwater concentration.

The groundwater concentrations, caused by leaching from the soil, predicted to occur at the wellfield exceeded Maximum Contaminant Levels (MCLs) for benzene, 1,2-dichloroethane, and trichloroethene. MCLs are discussed in detail in the section on Consistency With Other Laws. The 10^{-6} excess lifetime cancer risk was also exceeded for other compounds. The predicted concentrations at the wellfield were 17 ug/l of benzene, 56 ug/l for 1,2-dichloroethane, and 5 ug/l for trichloroethene. At the site boundary these predicted concentrations were 140 ug/l, 470 ug/l and 430 ug/l, respectively.

To eliminate this risk to groundwater, a reverse calculation was used to calculate the concentration of benzene, 1,2-dichloroethane, and trichloroethene that could remain in the soils and not pose a threat due to leaching. This strategy indicates that 37,700 cubic yards of soil must be remediated. Concentrations in the soil of benzene and 1,2-dichloroethane exceed their respective target concentrations listed in Table 7. Based on the concentration of contaminants and the extent of contamination, (8 feet across the entire site, 12 feet across 50 percent of the site), the recommended volume of soil for remediation to an average depth of 10 feet is 35,980 cubic yards. Figure 7 presents the area of soil remediation defined by Strategy II. The volume of contaminated sediments (600 cubic yards) and subsurface soils at the magic pit (1,125 cubic yards) should also be included. Therefore, the volume of soil to be remediated is 37,700 cubic yards. (The FS used the volume 36,600 cubic yards.) A recalculation of the volumes was performed and the actual volume is 37,700 cubic yards. This will not significantly affect the costs nor will it affect the alternative evaluation since they are all consistent.)

To summarize, contaminated soil poses a threat to human health and the environment due to direct contact with contaminated soil at the site and ingestion of groundwater contaminated from leaching from the soil. Two soil strategies were developed to mitigate these risks. The first strategy (7,125 cubic yards) addresses only the direct contact threat; in that strategy the source of contamination at the site remains to leach into the groundwater at some future time. The second strategy (37,700 cubic yards) addresses all migration pathways and risk to human health and the environment (direct contact and future leaching into groundwater from the soil at the site).

Groundwater Analysis

The concentrations of volatile organic compounds and metals in the upper, middle and lower outwash lenses of the upper aquifer and in the lower aquifer are consistently greater than MCLs, Table 1 values and risk-based values. (Risk-based values are the calculated excess lifetime cancer risk levels). Therefore, extraction and treatment of groundwater from the upper outwash lens, the middle outwash lenses, and the lower outwash lens/lower aquifer is necessary to protect public health and the environment.

Use of french drains or subsurface drains to collect and extract groundwater from the upper outwash lens is proposed. The french drain is described in detail in the FS. The system will be constructed along the western and northern edge of the upper outwash lens to a depth of approximately 16 feet.

Use of one extraction well is proposed to capture groundwater from beneath the site. (The need for additional wells, final well placement, and pumping rates will be determined by conducting a pump test at the site). This extraction well would be located on the western edge of the site as shown in Figure 8. This well, which will be approximately 100 feet deep, will be screened 25 feet into the lower aquifer. This well will pump approximately 300 gallons per minute (gpm) in order to capture groundwater beneath the site to a depth of 25 feet, including groundwater from the lower outwash lens. A pump test will be conducted to assess the relationship between the middle and lower outwash lenses and the lower aquifer. Additional groundwater monitoring will also be done to confirm the placement of the well.

On-site treatment of groundwater is considered appropriate for the upper aquifer and the lower aquifer at the Pristine, Inc. site. Since the level and nature of contamination and the rate of groundwater extraction are different for each aquifer the groundwater will be extracted and treated differently.

Groundwater in the upper outwash lens of the upper aquifer contains volatile and semi-volatile organic contaminants. On-site treatment using granular activated carbon (GAC) is considered appropriate because of the low extraction rate (1-5 gpm) and a total pore volume of 1,000,000 gallons in the upper outwash lens. Sampling of the GAC for radon decay products is required.

Groundwater in the lower aquifer has relatively low concentrations of volatile organic contaminants. The rate of extraction is estimated to be in the range of 300 gpm. Removal of volatile organics by air stripping with carbon off-gas treatment is the recommended treatment for this groundwater. The carbon will need to be monitored for breakthrough of radon gas emissions. In addition, if radon decay products are present the gamma exposure rate should be considered as a potential occupational threat to workers from the carbon bed. The treatment will remove 90 to 99 percent of the contaminants. This treatment method is expected to reduce organic contaminant levels to concentrations that will meet the National Pollution Discharge Elimination System (NPDES) requirements.

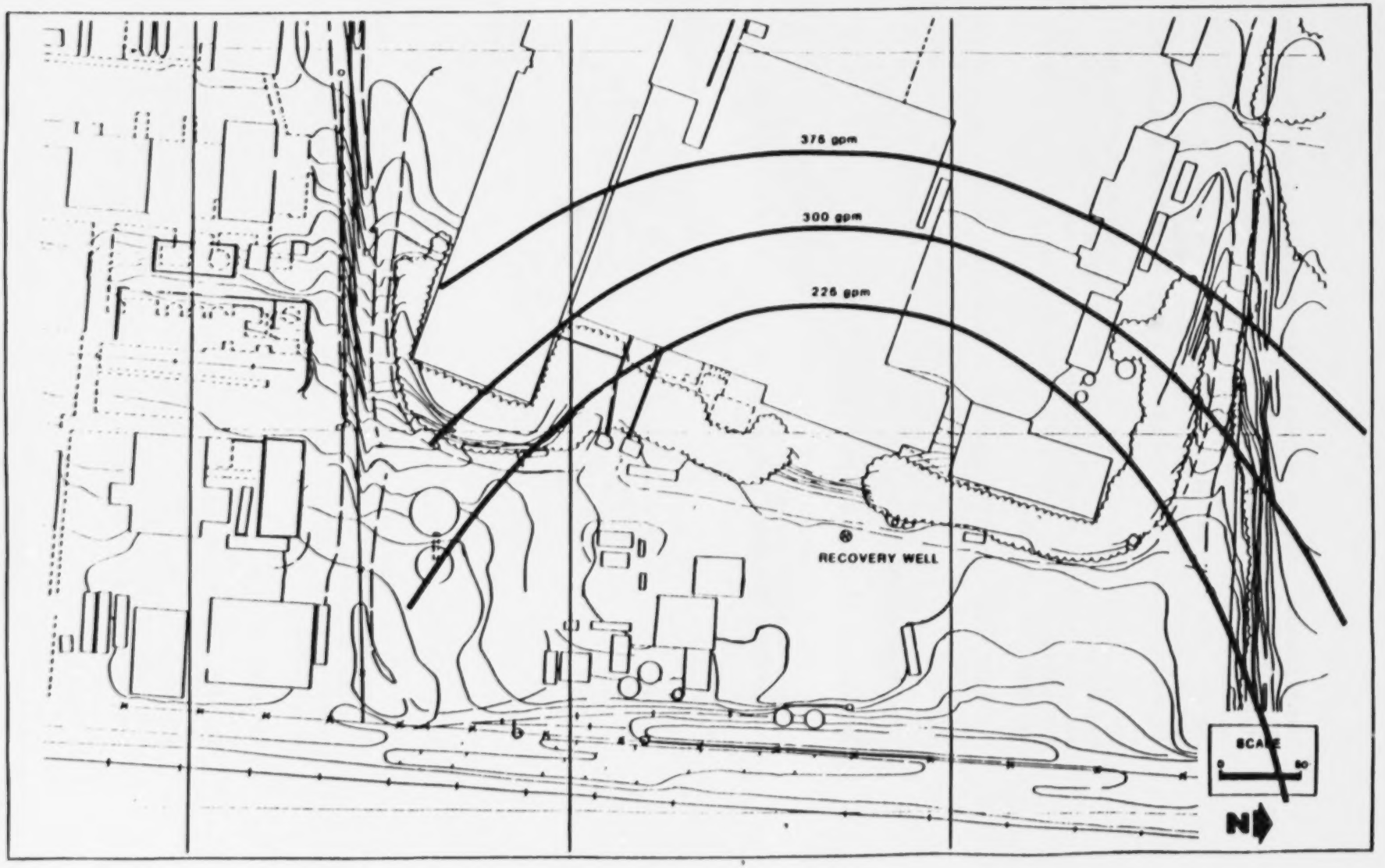


FIGURE 8

The estimated length of extraction and treatment of groundwater from the lower outwash lens/lower aquifer will be dependent on the extent of soil remediation and the extent of the plume from the Pristine, Inc. site. The additional plume definition work will be conducted concurrently with the design. The time necessary to remediate the aquifer is ultimately tied to meeting target cleanup levels in the groundwater. These target cleanup levels are discussed in the section on Consistency With Other Laws.

For soil remediation Strategy I (7,125 cubic yards), the length of groundwater treatment is estimated to be approximately 50 years. This estimate is based on the groundwater travel times reported in the RI and on the assumption that contaminants will continue to migrate from the soils of the upper outwash lens.

For soil remediation Strategy II (37,700 cubic yards), it is estimated that the length of treatment for the lower outwash lens/lower aquifer will be approximately five to ten years. The treatment time is decreased because the source, which will contribute over time to groundwater contamination (the upper outwash lens), is removed.

Description of Alternatives

Using this information, the alternatives are described in detail. Three additional alternatives were developed to account for the two soil strategies. The major components of the alternatives are as follows:

ALTERNATIVE NUMBER	SOIL	STRUCTURES
1A	In-situ Vitrification (37,700 yd^3)	*
1B	Onsite Vitrification (7,125 yd^3)	*
2A	Onsite Incineration (37,700 yd^3)	*
2B	Onsite Incineration (7,125 yd^3)	*
3A	Offsite Landfill (37,700 yd^3)	*
3B	Offsite Landfill (37,700 yd^3)	*
4	Onsite Landfill (11,000 yd^3)	Onsite landfill
5	Multilayer Cap	Onsite Consolidation
6	No Action	No Action

* = Decontamination/Solid Waste Landfill

Note: Groundwater will be extracted using a french drain and a minimum of one extraction well and air stripping with carbon off-gas treatment and granular activated carbon (GAC) groundwater treatment for all alternatives except 1A and 6. 1A will not require GAC water treatment and 6 will have no treatment.

Alternative 1A

The major components of alternative 1A are excavation and on-site consolidation of contaminated sediment, in-situ vitrification (ISV) of an average of ten feet of contaminated soil and sediment (37,700 cubic yards), clay cap, groundwater extraction using an extraction well, groundwater treatment using air stripping, discharge of treated water to Mill Creek,

decontamination and off-site disposal of structures, access restrictions and groundwater monitoring.

ISV will require the insertion of four electrodes in a 25 foot square array. The soil will be vitrified for varying depths across the site as shown in Figure 7.

A path for electric current is established by using a small amount of graphite and glass frit mixture placed between the electrodes on the soil surface. Dissipation of power through the starter material creates temperatures high enough (up to 2000^{0} C) to melt soil. This molten zone continues to grow downward, encompassing the contaminated soil. Rocks, which are less dense, create a floating rock layer near the molten surface. The rocks will eventually be incorporated into the molten mass. As the molten, or vitrified zone grows, it incorporates nonvolatile hazardous elements, such as heavy metals, and destroys organic compounds by pyrolysis through the addition of heat. The pyrolyzed products migrate to the surface of the vitrified zone where they combust in the presence of oxygen. A hood placed over the area being vitrified directs gaseous effluent to an off-gas treatment system. The off-gas treatment system cools, scrubs and filters the effluent exhausted from the hood. Remaining ash, along with other noncombustible materials, dissolves or become encapsulated in the molten soil. Natural convective currents within the molten soils help distribute the stabilized materials uniformly. The molten soil cools to a durable glass and crystalline waste form resembling natural obsidian. Air sampling is required during the vitrification process for volatile organic compounds and radon gas. The off-gas carbon treatment must be monitored for breakthrough of radon decay products.

Alternative 1A involves excavation of contaminated soil from the magic pit area and consolidation of this soil on the surface of the site. This contaminated soil will be vitrified along with an average of approximately ten feet of contaminated soil across the entire 2.2 acre site. (One area will be vitrified to twelve feet and another area to eight feet.) Vitrification of the entire site to an average depth of ten feet will require 157-25 x 25 x 10 foot cells. The estimated time required to complete the vitrification process is two years assuming the use of one vitrification unit. A vegetative soil cover will be placed over the vitrified mass.

Alternative 1A requires the installation of a french drain along the eastern boundary of the site to intercept groundwater that presently flows into the on-site upper outwash lens and will no longer be able to do so because the lens will essentially be eliminated by the vitrification process. This is to prevent groundwater mounding. Groundwater mounding is a concern because of its potential effect on the stability of the adjacent railroad tracks. Although the intercepted groundwater is not anticipated to be contaminated since it will be intercepted as it enters the site, it will be sent to the treatment system prior to discharge to Mill Creek. An assessment will be made during operation to determine whether there is a need to continue pumping.

Extraction and treatment of groundwater from the middle and lower lenses and lower aquifer is required. At least one eight-inch extraction well

will be placed to allow extraction of groundwater. The duration of the cleanup will be dictated by monitoring results, and the treatment time will ultimately be based on meeting target cleanup levels in the contaminated groundwater that has and will have migrated from the site. It is estimated that it will take five to ten years to extract and treat the contaminated groundwater. Future work will be done to define the extent of contamination from the Pristine, Inc. site in the lower aquifer. This may increase the extraction and treatment time. The recovery well or wells will be screened in the upper 25 feet of the lower aquifer.

The on-site treatment facility will consist of air stripping with carbon off-gas for treatment of groundwater. Bench scale studies will be done to determine the need for metals treatment. This facility may need to be located adjacent to the site.

Effluent will be discharged to Mill Creek. The effluent quality will meet NPDES discharge limits.

Alternative 1A will include decontamination and demolition of all on-site structures. This includes buildings, the incinerator, foundations, concrete pads, and storage tanks. Following decontamination, the debris will be disposed of in a non-RCRA landfill.

The site is presently fenced along the northern, southern and eastern boundaries. The site is not fenced along the western boundary and access to the site is unrestricted to employees of the adjacent industrial facility. Fencing of the western boundary will limit access to the site and would prevent exposure to contaminants present at the site. The use of deed restrictions will be considered during the remedial design. Groundwater monitoring will be undertaken.

Overall implementation of Alternative 1A is estimated to take 2.8 years. However, treatment of groundwater from the lower aquifer will continue until target cleanup concentrations are met in the groundwater. These target cleanup levels are discussed in the section on Consistency With Other Laws.

Alternative 1B

The major components of Alternative 1B are the same as Alternative 1A with several exceptions. Alternative 1B involves on-site vitrification whereby 7,125 cubic yards of soil will be moved to the southern half of the site and vitrified on top of the site. Also, the site will be covered with a RCRA cap, and the groundwater in the upper outwash lens will be treated using GAC. The GAC will require analysis for radon. The french drain will be located along the western and northern edge of the upper outwash lens, rather than on the eastern edge of the site, to capture the contaminated groundwater. The structures will be demolished, decontaminated, and disposed of at an off-site disposal facility.

Alternative 1B involves excavation of an average of two feet of contaminated soil across the entire 2.2 acre site and excavation of contaminated soil from the magic pit area. The combined 7,125 cubic yards of contaminated soil will be moved to the southern end of the site for

subsequent vitrification. The reason for consolidating the contaminated soil at one location, instead of vitrifying the soil in place as in Alternative 1A, is that vitrification to a depth of only two feet is thermally inefficient. Therefore the soil will be placed on the surface of the site and will occupy a space of approximately 100 feet x 175 feet and will extend to a height of ten feet above the existing grade at the southern end of the site. Since the soil to be vitrified is above grade, it will be necessary to confine the sides of the contaminated soil mass. This will be accomplished by surrounding the contaminated soil mass with an embankment (3:1 slope) constructed with clean soil brought from off-site. The combined area occupied by the contaminated soil and the confining embankment will be approximately 170 feet x 230 feet and is essentially the entire southern part of the site. The entire site will be capped with a RCRA cap.

The vitrification process will be accomplished in 35-25 x 25 x 10 foot cells. The estimated time required to complete the vitrification process including excavation of the contaminated soil and preparation of the soil for vitrification is six months. Air sampling is required during the vitrification process.

Alternative 1B requires the extraction and treatment of groundwater from the upper outwash lens because the lens will not be vitrified under this alternative. The volume of water within the lens at any one time is estimated to be approximately 1,000,000 gallons. A french drain system will be used to extract the groundwater in the upper outwash lens and act as a barrier to intercept flow through the lens. The french drain will be installed along the western and northern boundaries of the lens. The french drain will be 400 feet long and 16 feet deep. It is estimated that it will take approximately six months to extract the groundwater (one pore volume) from the upper outwash lens. Residual contamination in the soil will remain after the lens is drained. Extraction of groundwater from the middle and lower outwash lenses and lower aquifer will be done using a well (or wells).

Alternative 2A

The major components of Alternative 2A are the same as Alternative 1A with several exceptions. The soil will be incinerated in an on-site facility and the groundwater in the upper outwash lens will be treated using GAC. Significant quantities of ash (potentially as much as 85% of the original volume) would result. Air monitoring is required during implementation.

For purposes of the Feasibility Study (FS), U.S. EPA assumed that the ash would be delisted and remain on-site, covered with clean fill and compacted.

It is expected that implementation of this remedy, excluding groundwater remediation, will be about two years.

Alternative 2B

Alternative 2B involves the same components as Alternative 1B except that the soil is to be incinerated rather than vitrified.

The time to implement this remedy, excluding groundwater remediation, is 1.5 years.

Alternative 3A

The major components of Alternative 3A are the same as Alternative 1A except that the soil will be excavated and disposed of, without treatment, in an off-site land disposal facility and the groundwater in the upper outwash lens will be treated using GAC. Because there is dioxin present in some of the soil and ash, and due to the uncertainties associated with treatment standards, offsite disposal of dioxin-contaminated soil and ash may not be implementable due to the Land Disposal Restrictions. Those soils would need to be incinerated or treated separately.

It is expected that implementation of this remedy, excluding groundwater remediation, will be about a year.

Alternative 3B

Alternative 3B involves the same components as Alternative 1B except that the soil is to be transported to an off-site disposal facility rather than vitrified. The same issue regarding dioxin applies to this alternative.

The time to implement this remedy, excluding the groundwater remediation, is about one year.

Alternative 4

The major components of Alternative 4 are excavation of an approximately 7,125 cubic yards of contaminated soil and sediment, disposal in an on-site RCRA-type cell, and installation of a RCRA-type cap over the remainder of the site. All other components of this alternative are the same as Alternative 1B. The dioxin contaminated soil would need to be managed as in Alternative 3A.

The estimated volume of material to be contained in the cell is 11,000 cubic yards. This volume accounts for excavated soil and debris as a result of demolition of existing structures. The RCRA-type cell with dimensions of 120 feet x 300 feet would be designed to comply with RCRA guidelines. The RCRA-type cell would be constructed with five feet of storage capacity below grade and with six feet of storage capacity above grade. The cell would be a bottom liner system consisting of two synthetic liners, clay liner, leachate detection system and a leachate collection system. The final cover would include a clay liner, flexible membrane liner, drainage layer, filter layer, and a vegetated top soil layer. A RCRA-type cap would be installed across the remainder of the site since some contaminated soil residual would remain at the site outside the RCRA-type cell.

Overall implementation of this remedial action, excluding groundwater treatment, is expected to take approximately one year.

Alternative 5

The major component of Alternative 5 is installation of a RCRA cap over the entire site. The other components of this alternative are the same as Alternative 1B.

A multilayer cap would be installed over the entire site. The multilayer cap would conform to the RCRA standards for closure of a hazardous waste landfill. The RCRA "model" cap consists of the following: a clay liner, a bedding layer installed on top of the clay liner, an impervious layer, (synthetic liner), a drainage layer, and a vegetative cover.

Overall implementation of this remedial action, excluding groundwater treatment, is expected to take one year.

Alternative 6

Under this alternative, no remedial action will be taken at the site. Endangerment to public health and the environment will not be mitigated. It is primarily included as a baseline scenario to which other alternatives can be compared.

ALTERNATIVES EVALUATION

Each of the six alternatives was evaluated using a number of evaluation factors. The regulatory basis for these factors comes from the National Contingency Plan and Section 121 of SARA (Cleanup Standards). Section 121(b)(1) states that, "Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants, and contaminants is a principle element, are to be preferred over remedial actions not involving such treatment. The offsite transport and disposal of hazardous substances or contaminated materials without such treatment should be the least favored alternative remedial action where practicable treatment technologies are available." Section 121(b)(1) also states that the following factors shall be addressed during the remedy selection process:

(A) the long-term uncertainties associated with land disposal;
(B) the goals, objectives, and requirements of the Solid Waste Disposal Act;
(C) the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their constituents;
(D) short- and long-term potential for adverse health effects from human exposure;
(E) long-term maintenance costs;
(F) the potential for future remedial action costs if the alternative remedial action in question were to fail; and
(G) the potential threat to human health and the environment associated with excavation, transportation, and redisposal, or containment.

Section 121 of SARA requires that the selected remedy is to be protective of human health and the environment, cost-effective, and uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

In addition to the factors listed in Section 121 of SARA, alternatives were evaluated using current U.S. EPA guidance, including: "Interim Guidance on Superfund Selection of Remedy" dated December 24, 1986 and "Additional Interim Guidance for FY'87 Records of Decision" dated July 24, 1987. In the July 24, 1987 guidance, the following nine evaluation factors are referenced:

1. Compliance with applicable, or relevant and appropriate requirements (ARARs) (see discussion below)
2. Reduction of Toxicity, Mobility, or Volume
3. Short-Term Effectiveness
4. Long-Term Effectiveness and Protectiveness
5. Implementability
6. Cost
7. Community Acceptance
8. State Acceptance
9. Overall Protection of Human Health and the Environment

The analysis in the following section was performed using the above factors. Table 8 is a summary of this evaluation.

Alternative 1A

Alternative 1A uses treatment as a principal element for contaminated media. The alternative includes in-situ vitrification of approximately 37,700 cubic yards of soil and treatment of groundwater. This alternative is expected to attain all identified Federal and State ARARs.

Vitrification for soil treatment is not a "proven" technology, although there have been at least four full-scale demonstrations and forty three bench or pilot studies. Vitrification is expected to be effective on the soil type present at the Pristine, Inc. site. (Vitrification is also discussed in detail in the FS.) Vitrification will encapsulate the metals and pyrolyze the organics present in the soils. The organics, some of which are expected to volatilize, will be captured by a vacuum hood. Air monitoring will be conducted to ensure that the hood is collecting and treating the gases. This alternative will address soil contamination to levels that will protect human health and the environment by treating contaminated soil that contributes to a direct contact threat through incidental ingestion and absorption, and by treating soils to levels such that the residual soil contamination will not contribute to groundwater contamination in the future. Some limited monitoring of the vitrified mass will be required to assure that it is a reliable and permanent remedy. The expected life of the vitrified mass, referred to as obsidian-like material, is a million years. In the natural environment, the vitrified waste is expected to weather less than 1-millimeter (hydrated depth) over a 10,000-year time span.

TABLE 8

Technical Evaluation Criteria	Alternatives 1A and 1B Vitrification, Remediation of Groundwater and Structures	Alternatives 2A and 2B On Site Incineration, Remediation of Groundwater and Structures	Alternatives 3A and 3B Off Site NCDC Landfill, Remediation of Groundwater and Structures
EFFECTIVENESS			
A. Short Term Protectiveness			
Protection of Public Health and Environment from Contaminated Soil	Effective in protecting public health and environment from incidental ingestion and dermal absorption for an indefinite period of time. (Life of vitrified obsidian is greater than 1 million years.) For Alternative 1A the risk would be eliminated, the residue would not pose any risk. For Alternative 1B, the residuals will remain in place and there is potential for continued migration of contaminants to the groundwater.	Effective in protecting public health and environment from incidental ingestion and dermal absorption given proper implementation. For Alternative 2A the risk would be eliminated, the residues would not pose any risk. For Alternative 2B, the residuals will remain in place and there is potential for continued migration of contaminants to the groundwater.	Effective in protecting public health and environment from incidental ingestion and dermal absorption given proper implementation and maintenance for a minimum 30 yr monitoring period. For Alt. 3B, residuals remain in place and there is potential for continued migration of contaminants to the groundwater.
Protection of Public Health and Environment from Ingestion of Groundwater and Future Migration of Groundwater Contaminants	Extraction and on site treatment of groundwater would significantly reduce the risks associated with ingestion of contaminated groundwater from the site. On site treatment system would be effective on reducing groundwater contaminant levels. No significant adverse from effluent discharge.	Extraction and on site treatment of groundwater would significantly reduce the potential risks associated with ingestion of contaminated groundwater from the site. On site treatment system would be effective in reducing groundwater contaminant levels. No significant adverse impact from effluent discharge.	Extraction and on site treatment of groundwater would significantly reduce the potential risks associated with ingestion of contaminated groundwater from the site. On site treatment system would be effective in reducing groundwater contaminant levels. No significant adverse impact from effluent discharge.
Compliance with ARARs	Alternatives 1A and 1B will attain all identified Federal and State ARARs.	Alternatives 2A and 2B will attain all identified Federal and State ARARs.	Alternatives 3A and 3B will meet all identified Federal and State
Time until Protection is Achieved	After equipment is obtained, it will take 2.8 years to to complete Alt. 1A, and 3.5 years to complete Alt. 1B. The upper outwash zone will be cleaned in 0.5 years. The length of treatment of the lower aquifer will be dependent on the exit remedial action, varying from five years to 50 years and until ARARs are met.	After equipment is obtained, it will take 2 years or 3.5 years to complete for Alt 2A or 2B, respectively. The upper outwash zone will be cleaned and treated in 0.5 years. The length of treatment of the lower aquifer will be dependent on the exit remedial action, varying from 5 years to 50 years and until ARARs are met	It will take 3.3 years to complete for Alt. 3A for off site disposal, and 3.3 years to complete for Alt. 3B. The upper outwash zone will be cleaned and treated on 0.5 years. The length of treatment of the lower aquifer will be dependent on the exit remedial action, varying from 5 years to 50 years.
B. Long Term Protectiveness			
Magnitude of Residual Risk	Vitrification of soil for Alt. 1A will eliminate risk due to residuals. Vitrification of soil for Alt. 1B will not eliminate risk due to residuals that leach. Potential for continued groundwater contamination exists the groundwater treatment systems are designed to eliminate residual risk.	Incineration for Alt. 2A for soil will eliminate risk due to residuals Incineration for Alt. 2B of soil will not mitigate risk due to residuals the groundwater treatment systems are design to eliminate residual risk.	Excavation of soil for Alt. 3A will eliminate risk due to residuals at the surface. Excavation of soil for Alt. 3B will not mitigate risk due to leachable residuals. The groundwater treatment system are designed to eliminate residual risk. Does not eliminate long term risk, only contains.
Long Term Reliability	Vitrification is not a proven remedy. There have been four full scale application to date, results indicate vitrification to be a reliable technology. An additional application is being planned by EPA for a PCB contaminated site.	Use of mobile incinerator for contaminated soil such as that found at Pristine is a proven and reliable technology.	Long term reliability of NCDC Landfills is unknown. Landfills meeting RCRA standards have only been in use since the early 1980s therefore, long term reliability data is not available. Release of contaminants will occur if cover fails.
	Collection of groundwater through use of extraction wells and french drains is a proven technology and is reliable.	Collection of groundwater through use of extraction wells and french drains is a proven technology and is reliability.	Collection of groundwater through use of extraction wells and french drains is a proven technology and is reliability.

Table 8 (Continued)

	Alternative 4 On Site RCRA Landfill, Remediation of Groundwater and Structures	Alternative 5 RCRA Cap, Remediation of Groundwater and Structures	Alternative 6 No Action
EFFECTIVENESS			
A. Short Term Protectiveness			
Protection of Public Health and Environment from Contaminated Soil	Effective in protecting public health and environment from incidental ingestion and dermal absorption given proper implementation and maintenance for a minimum 30 yr monitoring period. Residuals remain in place and there is potential for continued migration of contaminants to the groundwater.	Effective in protecting public health and environment from incidental ingestion and dermal absorption given proper implementation of maintenance of cap for a minimum 30 yr monitoring period. Residuals remain in place and there is a potential for continued migration of contaminants to the groundwater	There would be no reduction in the risks associated with dermal contact and incidental ingestion of the soil. In addition, contaminants will continue to migrate to the groundwater.
Protection of Public Health and Environment from Direct Ingestion of Groundwater and Future Migration of Groundwater Contaminants	Extraction and on site treatment of groundwater would significantly reduce the potential risks associated with ingestion of contaminated groundwater from the site. On site treatment system would be effective in reducing groundwater contaminant levels. No significant adverse impact from effluent discharge.	Extraction and on site treatment of groundwater would significantly reduce the potential risks associated with ingestion of contaminated groundwater from the site. On site treatment system would be effective in reducing groundwater contaminant levels. No significant adverse impact from effluent discharge.	Deed restriction prohibiting the installation of wells on site does not eliminate potential exposure to groundwater contaminants, and does not reduce risks associated with ingestion of contaminated groundwater.
Compliance with ARARs	Alternative 4 will attain all identified federal and State ARARs.	Alternative 5 will attain all identified federal and State ARARs.	Alternative 6 will not attain any federal and [illegible] ARARs.
Time until Protection is Achieved	It will take 1 years to complete Alt. 4. The upper outwash zone will be cleaned and treated in 0.5 years. The length of treatment of the lower aquifer is estimated to be 30 years and until ROAs are met.	It will take 1 years to complete Alt. 5. The upper outwash zone will be cleaned and treated in 0.5 years. The length of treatment of the lower aquifer is expected to be 30 years and until ROAs are met.	
B. Long Term Protectiveness			
Magnitude of Residual Risk	Partial excavation of soils will not mitigate to risk due to residuals. The groundwater treatment system are designed to eliminate residual risk.	Capping soils will not mitigate to risk due to residuals. The groundwater treatment systems are designed to eliminate residual risk.	
Long Term Reliability	Long term reliability of an on site RCRA landfill is unknown. Landfills that meet RCRA standards have only been in use since the early 1980s. Therefore, long term reliability data is not available. If failure occurs, there will be additional remedial actions/costs.	Long term reliability of multilayer cap is unknown because of the need for long term maintenance. If failure occurs, it will be necessary to implement additional remedial actions.	
	Collection of groundwater through use of extraction wells and treatment plant is reliable.	Collection of groundwater through use of extraction well and treatment plant is reliability.	

TABLE 8 (Continued)

Technical Evaluation Criteria	Alternatives 1A and 1B Verification, Remediation of Groundwater and Structures	Alternatives 2A and 2B On-Site Incineration, Remediation of Groundwater and Structures	Alternative 3A and 3B Off-Site RCRA Landfill, Remediation of Groundwater and Structures
EFFECTIVENESS			
B. Long-Term Effectiveness (Cont'd)			
Potential Need for Replacement	The predicted useful life is 1 million years due to the inert nature of the residual.	Incineration of a listed waste will produce hazardous ash. Ash will need to be delisted. If delisting cannot be achieved both alternatives will rely on effectiveness of cap.	Due to the short history of RCRA landfill applications actual useful life data is unavailable. Will be additional remedial action costs if cell fails.
C. Reduction of Toxicity, Mobility or Volume	Verification will reduce the toxicity, mobility, and volume of hazardous constituents in the soil. Alternative 1A will reduce all constituents which pose a threat due to dermal absorption or ingestion in addition to reducing the leaching of contaminants in the groundwater. Alternative 1B will only reduce threat due to dermal absorption and ingestion. The groundwater treatment system will reduce the toxicity, mobility, and volume of hazardous constituents in the groundwater.	Incineration will reduce the toxicity, mobility, and volume of hazardous constituents in the soil. Alternative 2A will reduce all constituents which pose a threat due to dermal absorption or ingestion in addition to reducing the leaching of contaminants in the groundwater. Alternative 2B will only reduce threat due to dermal absorption and ingestion. The groundwater treatment system will reduce the toxicity, mobility, and volume of hazardous constituents in the groundwater.	There will be no reduction of toxicity or volume of hazardous constituents in the soil. The reduction of mobility depends on the reliability of the disposal cell. The groundwater treatment system will reduce the toxicity, mobility, and volume of hazardous constituents in the groundwater.
IMPLEMENTABILITY			
A. Short-Term Technical Feasibility			
Demonstrated Performance	Limited demonstrated performance. VX, GAA, GB are expected for chlorine and PCBs.	Acceptable demonstrated performance. Mobile incinerator is a commonly used technology. VX, GAA, GB are expected for chlorine and PCBs.	Performance has been demonstrated since the use of RCRA landfills was instituted in the early 1980s. Properly designed and maintained RCRA landfills have adequately demonstrated performance on available data.
Ability to Construct Technology	Relatively easy to install from a technical standpoint.	Relatively easy to install from a technical standpoint.	Implementation time would be that associated with waste acceptance by the landfill.
Compliance with Action Specific ARARs	This alternative will attain all Action Specific ARARs.	This alternative will attain all Action Specific ARARs.	This alternative will attain all action specific ARARs.
B. Long-Term Technical Feasibility			
Operational Complexity	Complex operations during the period of the verification process. Skilled operators are required.	Complex operations during the period of the incineration process. Skilled operators are required.	RCRA landfill is not technically complex, however, a skilled manager is required to ensure compliance with numerous operational provisions and governmental regulations.
Operational Flexibility	Use of multiple verification units will allow operational flexibility and reduce time to implement.	Incinerator through put can be varied allowing operational flexibility.	Not applicable for off-site RCRA landfill.

Table 8 (Continued)

Technical Evaluation Criteria	Alternative 4 On-Site RCRA Landfill, Remediation of Groundwater and Structures	Alternative 5 RCRA Cap, Remediation of Groundwater and Structures	Alternative 6 No Action
EFFECTIVENESS			
Potential Need for Replacement	Due to the short history of RCRA landfill applications, actual useful life data is unavailable. However, the projected useful life, assuming proper post closure maintenance is at least the 30 year monitoring period.	Useful life of multilayer cap is estimated at a minimum 30 monitoring period. Useful life of pumps and appurtenances is 15 years if properly maintained. Replacement is required after	
C. Reduction of Toxicity, Mobility, or Volume	There will be no reduction of toxicity or volume of hazardous constituents in the soil. The reduction of mobility depends on the reliability of the disposal cell. The groundwater treatment system will reduce the toxicity, mobility, and volume of hazardous constituents in the groundwater.	There will be no reduction of toxicity or volume of hazardous constituents in the soil. The reduction of mobility depends on the reliability of the cap. The groundwater treatment system will reduce the toxicity, mobility, and volume of hazardous constituents in the groundwater.	There will be no reduction of toxicity, volume or mobility of hazardous constituents in the soil or groundwater.
IMPLEMENTABILITY			
A. Short Term Technical Feasibility			
Demonstrated Performance	Performance has been demonstrated since the use of RCRA landfills were instituted in the early 1980s. Properly designed and maintained RCRA landfills have adequately demonstrated performance based on available data.	Capping has been shown to be effective for short term periods long term performance has not been demonstrated due to the short history of hazardous waste site closures.	
Ability to Construct Technology	On-site RCRA landfill requires careful installation of each media, especially the impermeable membrane.	Multilayer cap requires careful installation of each media, especially the impermeable membrane.	
Compliance with Action-Specific ARARs	This alternative will attain all Action-Specific ARARs.	This alternative will attain all Action-Specific ARARs.	This alternative will not attain any ARARs.
B. Long Term Feasibility			
Operational Complexity	RCRA landfill is not technically complex, however, a skilled manager is required to ensure strict adherence to quality assurance procedures during construction.	RCRA cap is not technically complex, however, a skilled manager is required to ensure strict adherence to quality assurance procedures during construction.	
Operational Flexibility	Extraction well may be pumped at varying rates to provide flexibility in gradient control. Additional wells can be added if necessary.	Extraction well may be pumped at varying rates to provide flexibility in gradient control. Additional wells can be added if necessary.	

TABLE 8 (Continued)

Technical Evaluation Criteria	Alternatives 1A and 1B Vitrification, Remediation of Groundwater and Structures	Alternatives 2A and 2B On Site Incineration, Remediation of Groundwater and Structures	Alternatives 3A and 3B Off Site RCRA Landfill, Remediation of Groundwater and Structures
IMPLEMENTABILITY			
Reliance on Monitoring Results	Monitoring the vitrification process is critical to meet emission standards and required levels of contaminant destruction. Once operation is complete, low level of monitoring required to assure effectiveness. Monitoring the on site treatment system is critical to reliable operation.	Monitoring the incineration process is critical to meet emission standards and required levels of contaminant destruction. Once operation is complete low level of monitoring required to assure effectiveness. Monitoring the on site treatment system is critical to reliable operation.	Monitoring the on site treatment system is critical to reliable operation. High reliance on monitoring to assure effectiveness for indefinate period of time.
C Administrative Feasibility			
Ability to Obtain Permits	Some lead time to obtain vitrification license	May be difficult/time consuming to meet requirements of permit.	Land Disposal Restrictions may preclude implementation. Off site policy must be complied with at landfill.
D Availability			
Availability of Needed Equipment/Specialists	Special equipment will be necessary to implement vitrification.	Special equipment will be necessary to implement incineration.	Not applicable.
Availability of Treatment Systems and Disposal Capacity	It will take more than 1 year to manufacture vitrification equipment. Groundwater treatment systems are readily available.	It may take up to 6 months for mobile incineration to become available. Additional incinerators can be manufactured. Groundwater treatment systems are readily available.	Capacity at off site RCRA landfill is available. New disposal cells are currently being constructed at some facilities. Groundwater treatment systems are readily available.
COST	1A / 1B	2A / 2B	3A / 3B
A. Construction	$17,004,000 / $5,750,000	$41,505,000 / $ 9,985,000	$17,009,000 / $5,121,000
B. Annual OEM	$ 96,000 / $ 99,200	$ 96,000 / $ 99,200	$ 99,000 / $ 102,200
C. Present Worth	$21,731,000 / $7,910,000	$51,469,000 / $11,106,000	$21,737,000 / $7,186,000

TABLE 8 (Continued)

Technical Evaluation Criteria	Alternative 4 On Site RCRA Landfill, Remediation of Groundwater and Structure	Alternative 5 RCRA Cap, Remediation of Groundwater and Structure	Alternative 6 No Action
IMPLEMENTABILITY			
B Long Term Technical Feasibility (Con't)			
Reliance on Monitoring Results	Monitoring is critical to successful implementation of this alternative to verify the integrity of the RCRA landfill. Monitoring the on site treatment system is critical for reliable operation.	Monitoring is critical to successful implementation of this alternative to verify the integrity of the RCRA cap. Monitoring the on site treatment system is critical for reliable operation.	
C Administrative Feasibility			
Ability to Obtain Permits	Land Disposal Restrictions may preclude implementation		
D Availability			
Availability of Wanted Equipment	Normal construction equipment is required	Normal construction equipment is required	
Availability of Treatment System and Disposal Capacity	Groundwater treatment systems readily available	Groundwater treatment systems readily available	
COST			
A Construction	$ 2,170,000	$ 1,555,000	
B Annual OEM	$ 101,500	$ 99,200	
C Present Worth	$ 3,602,000	$ 3,049,000	

Alternative 1A will significantly reduce the mobility, toxicity, and volume of hazardous substances in the soil through treatment. The mobility of the contaminants will be reduced significantly, such that no leachate is expected to be produced from the vitrified material. This is a permanent technology, the results of which are expected to last for a million years. The toxicity of organic components will be decreased because the organics are destroyed or changed to other forms by pyrolysis or vaporization. The volume of the soil will be reduced by 25-30 percent because the vitrification causes the soil mass to consolidate. Decontamination of site structures will be carried out in accordance with the RCRA requirements and will reduce the threat associated with these contaminated structures.

Implementation of this remedy poses some short term risks due to inhalation of dust during soil excavation and decontamination procedures. During the vitrification procedure, some organic compounds will volatilize. A vacuum hood over the vitrified area will be designed to control and treat any release of gas to the environment. There is a short term risk from the heat generated in the process. Implementation of this alternative is expected to take 2.8 years to complete. The equipment must be specially designed and produced. Approximately six to twelve months will be needed to manufacture the equipment. This will occur concurrently with the remedial design. It is estimated that groundwater will be extracted and treated for approximately five to ten years.

Although there have been limited performance demonstrations, it is expected that the vitrification will attain 99.9999% destruction and removal efficiency (DRE). The alternative will require a trained level of expertise to operate the power input and to oversee the movement of the equipment.

Although no on-site permits are needed, the technical requirements of NPDES for the surface water discharge will be met. ISV is a patented process which requires a license.

The groundwater extraction/treatment system will reduce the mobility, toxicity and volume of hazardous substances in the groundwater at the site. This extraction and treatment system will result in compliance with Federal and State ARARs. This portion of the alternative is fully protective of public health and the environment at the site.

The capital cost of this alternative is $20,837,000, the annual Operation and Maintenance (O&M) cost is $94,800 and the present worth cost is $21,731,000.

Alternative 1A will be fully protective of public health and the environment.

Alternative 1B

Alternative 1B also uses treatment as a principal element and decreases the mobility, toxicity and volume of the waste. This alternative will meet all identified State and Federal ARARs. The major difference is that this alternative is less permanent and protective than Alternative 1A since residual soil contamination will remain. It may leach into the groundwater

at levels that will exceed ARARs at some future time and thus increase the groundwater treatment time or require additional future remedial action. An estimated 7,125 cubic yards of soil will be vitrified on-site to eliminate the direct contact threat and site structures will be decontaminated and landfilled offsite.

The effectiveness of this alternative is dependent on maintaining the integrity of the cap through proper Operation and Maintenance (O&M). The cap will reduce the rate of infiltration of groundwater through the contaminated soils, thereby reducing the volume of leachate produced at the site. The lifetime of a RCRA multilayer cap is finite, and the contaminated soils will be left in place to contribute to groundwater contamination at some future time should the cap fail. Alternative 1B is less protective than Alternative 1A based on long term protectiveness. There are possible short term threats due to potential releases of volatiles during the vitrification process, although the vitrification system will be specifically designed with a hood to address the release of volatiles.

Alternative 1B requires excavation and consolidation of the wastes. This poses a short-term threat to public health and the environment.

The elements of the groundwater extraction evaluation are the same with the exception that groundwater will be treated over time in the upper outwash lens, since this lens will not be vitrified. The groundwater extraction/ treatment system will meet Federal and State ARARs, uses treatment as a principal element, and reduces the mobility, toxicity and volume of contaminants.

The capital cost of this alternative is $6,995,000, the annual O&M cost is $99,200, and the present worth cost is $7,930,000.

Alternative 2A

Alternative 2A uses treatment as a principal element for all contaminated media and reduces the mobility, toxicity and volume of the waste. Approximately 37,700 cubic yards of contaminated soil will be incinerated, structures will be decontaminated, and groundwater will be extracted and treated. This alternative will attain all identified Federal and State ARARs.

Incineration is a proven technology, which will permanently destroy organic chemicals in the soil (99.9999% DRE). However, metals are not destroyed by incineration and will become more concentrated in the ash. Noncombustibles and ash (potentially as much as 85 percent of the original volume) will be classified as hazardous because the contaminated soil is classified as a listed hazardous waste under RCRA. The delisting procedure will be necessary to classify the wastes as non-hazardous. Incineration of 37,700 cubic yards of contaminated soil is fully protective of human health and the environment since the ingestion and leachability threats are eliminated. No monitoring of the ash will be required. The expected reliable life of this alternative is infinite.

Implementation of this remedy poses some short term risks due to inhalation of soil dust during excavation and structure decontamination. Incineration may result in short-term low level emissions of a small fraction of the organics in the soil feed as well as the products of incomplete combustion (e.g., dioxins). Since there will be an air pollution control system on the incinerator to decrease emissions of particulate matter, emissions of contaminants will not exceed standards.

Implementation of this remedy is expected to take two years after the equipment is obtained. Approximately six to twelve months will be needed to obtain the equipment. This will occur concurrently with the remedial design. The use of mobile incinerators is common and the performance of these systems has been demonstrated. It is relatively easy to operate the system although a trained operator will be needed.

Although no onsite permits will be required, the requirements of incineration permits will be met. The other elements of this alternative are the same as Alternative 1A. The capital cost of Alternative 2A is $50,595,000, the annual O&M cost is $94,800 and the present worth cost is $51,489,000.

Alternative 2A will be fully protective of human health and the environment.

Alternative 2B

Alternative 2B also uses treatment as a principal element and decreases the mobility, toxicity and volume of [redacted]. This alternative will meet all identified State and Federal ARARs [redacted] major difference is that this alternative is less permanent and [redacted]ve than Alternative 2A since residual soil contamination will remain at the site that can leach into the groundwater at levels that may exceed ARARs at some future [redacted] thus increase the groundwater extraction/treatment time, or require additional future remedial action.

Approximately 7,125 cubic yards of soil will be incinerated on-site and structures will be decontaminated to eliminate the direct contact threat. The effectiveness of this alternative is dependent on maintaining the integrity of the cap through O&M, since soil contamination remains at the site. The cap will reduce the rate of infiltration of groundwater through the contaminated soils, thereby reducing the volume of leachate produced at the site. The lifetime of a RCRA multilayer cap is finite, and the contaminated soil will be left in place to contribute to groundwater contamination at some future time should the cap fail. Alternative 2B is less protective than Alternative 2A based on long-term protectiveness.

The elements of the groundwater extraction evaluation are the same. As the groundwater extraction/treatment system is the same as Alternative 1B, it will meet Federal and State ARARs, it uses treatment as a principal element, and reduces mobility, toxicity and volume of contaminants. Implementation of this remedy is expected to take 1.5 years.

The capital cost of this alternative is $12,169,000, the annual O&M cost is $99,200, and the present worth cost is $13,104,000.

Alternative 3A

Alternative 3A does not provide treatment as the principal element for 37,700 cubic yards of contaminated soil, but does provide treatment for structures and groundwater. Alternative 3A will meet all identified State and Federal ARARs.

Alternative 3A is protective of public health and the environment at the site. It eliminates the threat of migration of contaminants through excavation and containment of all soils that have the potential to leach into the groundwater. Alternative 3A involves excavation and containment of soils which contribute a threat to human health via ingestion and all soils that will pose a risk when leachate is produced. However, there will be no reduction of toxicity or volume of the contaminants and the reduction of mobility depends on maintaining the integrity of the off-site disposal cell. Although this alternative eliminates the risk to human health and the environment at the site due to contaminated soil, there is potential for the contaminated soil to cause a problem at the off-site facility. Alternative 3A may have significant short-term impacts on public health and the environment due to risk involved in the excavation and transportation of contaminated soil. Dioxin contamination may need to be treated separately or landfilled on-site. Since this alternative involves placement of contaminated soil, the Land Disposal Restrictions are ARARs. Because of the uncertainties of how this restriction will be carried out and the undefined treatment standards, this alternative may not be implementable.

As the groundwater extraction/treatment system is the same as Alternative 1A, it will reduce the mobility, toxicity, and volume of hazardous substances in the groundwater at the site. This extraction and treatment system will result in compliance with Federal and State ARARs. This portion of the alternative is fully protective of public health and the environment at the site.

In Section 121 of SARA, it is stated that off-site disposal without treatment is the least preferred alternative. Also, although Alternative 3A is readily implementable from a construction standpoint, the Land Disposal Restrictions may preclude actual implementation of this alternative.

The capital cost of this alternative is $20,834,000, the annual O&M cost is $95,800, and the present worth cost is $21,737,000. Although Alternative 3A will essentially eliminate threat to human health and the environment at the site, treatment is not used, the alternative does not provide an adequate level of permanence and is the least preferred under SARA. It is expected that it will take approximately one year to implement the soil removal.

Alternative 3B

Alternative 3B does not provide treatment, does not reduce mobility, toxicity and volume of the soil, and provides the same protection at the site as Alternatives 1B and 2B. The short and long-term risks posed by this remedy are the same as for Alternative 3A. Since this alternative involves placement of contaminated soil, the Land Disposal Restrictions are ARARs. Because of the uncertainties of how this restriction will be carried out and the undefined treatment standards, this alternative may not be implementable. Implementation of this remedy is expected to take about one year.

As the groundwater extraction/treatment system is the same as Alternative 1B, it will meet Federal and State ARARs, it uses treatment as a principal element, and reduces mobility, toxicity and volume of contaminants.

The capital cost of this alternative is $6,242,000, the present worth cost in $7,186,000, and the O&M cost is $100,200.

Alternative 4

Alternative 4 is a containment option. Alternative 4 involves containment of 7,125 cubic yards of soil and the structures which pose a threat to human health via ingestion at concentrations greater than the cumulative excess lifetime cancer risk. Alternative 4 does not mitigate the potential for release of contaminants that exceed MCLs from the subsurface soils into the groundwater through infiltration. Potential for additional remedial action costs remains. Alternative 4 meets all identified State and Federal ARARs, and minimizes the threat to public health and the environment. It does not treat the contaminated soil. There is no reduction in toxicity or volume of contaminated soil, and the reduction of mobility is dependent on maintaining the effectiveness of the disposal cell and the RCRA cap.

Although Alternative 4 is readily implementable and constructible, the long-term threat to public health and the environment is not mitigated. Since this alternative involves disposal, the Land Disposal Restrictions will apply and may preclude this alternative from being implemented. Long-term reliability of RCRA cells is unknown since the performance data are unknown. Alternative 4 will require long-term maintenance of the

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disposal cell and multilayer cap. Some short term risks will be posed by excavation of soil and construction of the cell. Implementation of this remedy is expected to take one year.

As the groundwater extraction/treatment system is the same as Alternative 1B, it will meet Federal and State ARARs, it uses treatment as a principal element, and reduces mobility, toxicity and volume of contaminants.

Because there is no treatment of soils to reduce the mobility, toxicity or volume, Alternative 4 does not provide an adequate level of permanence since the highly mobile contaminants remain at the site. The capital cost of this alternative is $2,646,000, the annual O&M cost is $101,500 and the present worth cost is $3,602,000.

Alternative 5

Alternative 5 is a containment option. There is no treatment for soil to reduce the mobility, toxicity or volume of the contaminants. There is treatment of the structures. Although mobility will be reduced because of the reduction of infiltration of rainwater through the cap, the potential remains for contaminants to continue to migrate should the cap fail, which may necessitate additional remedial action costs. Groundwater will continue to contact contaminated soil. This alternative is protective over the short-term, assuming the cap is constructed effectively. However, over the long term, this alternative is not protective. Contaminated soil will remain at the site and is not treated.

Alternative 5 does not provide an adequate level of permanence since there are highly mobile contaminants remaining at the site. Additional remedial action costs may be incurred should the cap fail in the future. Long-term reliability is unknown. Prevention of future exposure depends on the effectiveness of access restrictions and aquifer use restrictions, neither of which are enforceable.

As the groundwater extraction and treatment system is the same as Alternative 1B, it will meet Federal and State ARARs and it uses treatment as a principal element and reduces mobility, toxicity and volume of contaminants.

Although Alternative 5 provides some public health and environmental protection, it is not a permanent remedy that reduces the mobility, toxicity and volume. Hazardous substances in the soil remain in place and will require long-term maintenance. The capital cost of this alternative is $2,113,000, the annual O&M cost is $99,200, and the present worth cost is $3,049,000.

Alternative 6

Alternative 6, No Action, is ineffective in preventing further contaminant migration and does not mitigate or reduce the existing contamination at the site. It is not protective of public health and the environment. It will not meet Federal and State ARARs nor will it reduce the mobility, toxicity or volume of hazardous substances in the soil or groundwater. Hazardous substances in soil and groundwater will continue to migrate and

will cause additional public health and environmental threats. The alternative is not a permanent remedy. The risks that were outlined in the public health evaluation remain.

Recommended Remedy

The recommended remedy for selection and implementation is Alternative 1A. Alternatives 3A, 3B, 4, 5 and 6 clearly do not meet the preferences mandated by SARA since they do not use treatment as a principal element of the remedy. Alternative 6 leaves the site unchanged, which is unacceptable from a public health standpoint. It will not meet Federal or State ARARs. Alternatives 3A, 3B, 4 and 5 merely contain the waste to varying degrees without treatment. This is counter to the preferences established in Section 121(b) of SARA for implementation of remedial action. Alternatives 1A, 1B, 2A and 2B all use treatment as the principal element of the remedy. However, Alternatives 1B and 2B do not provide treatment of the soils which can potentially and significantly contribute to groundwater contamination should the remedial action fail. Both alternatives require long-term maintenance of the RCRA cap to maintain the effectiveness of the remedy. These alternatives are containment in subsurface soil below two feet remain at the site without treatment. The mobile contaminants in subsurface soil below two feet remain at the site without treatment. Since the contamination that can leach into the groundwater remains at the site, the potential for additional future remedial action remains. The long-term protectiveness and permanence of these alternatives are less than for Alternatives 1A and 2A. Therefore, Alternatives 1B and 2B are not recommended for implementation at the Pristine, Inc. site.

Alternative 1A and 2A will reduce the mobility, toxicity and volume of the contaminated media. The alternatives will meet identified Federal and State ARARs. Both alternatives are fully protective of human health and the environment. Each will require specialized equipment and operators, and will require similar maintenance effort. Both are technically feasible and implementable. However, vitrification is the lower cost alternative. Therefore, incineration is not recommended for implementation at the Pristine, Inc. site.

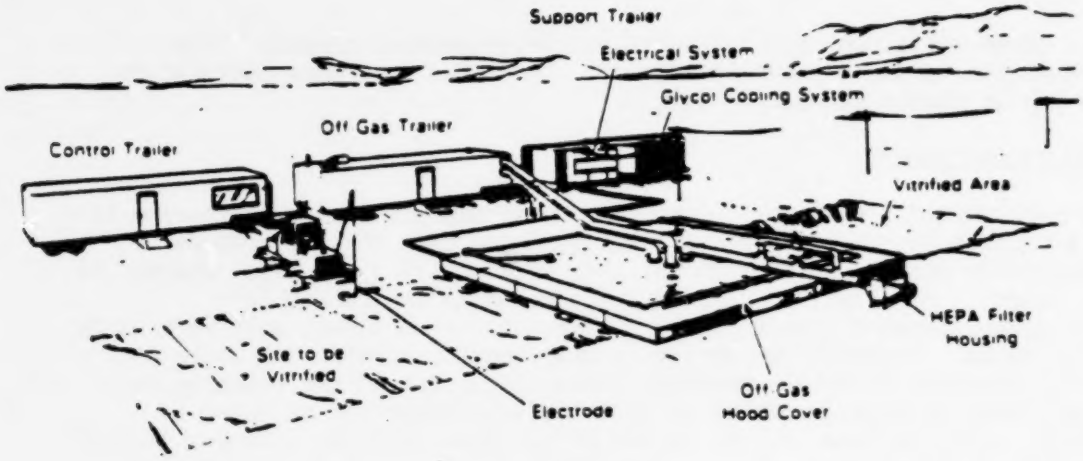
The Ohio EPA supports the selection of Alterntive 1A for the Pristine, Inc. site. They would support only the groundwater remedial action if another alternative is implemented. Their only reservation involves U.S. EPA's interpretation of SARA Section 121, groundwater cleanup levels, and how dioxin will be addressed. These matters are discussed in detail in the responsiveness summary.

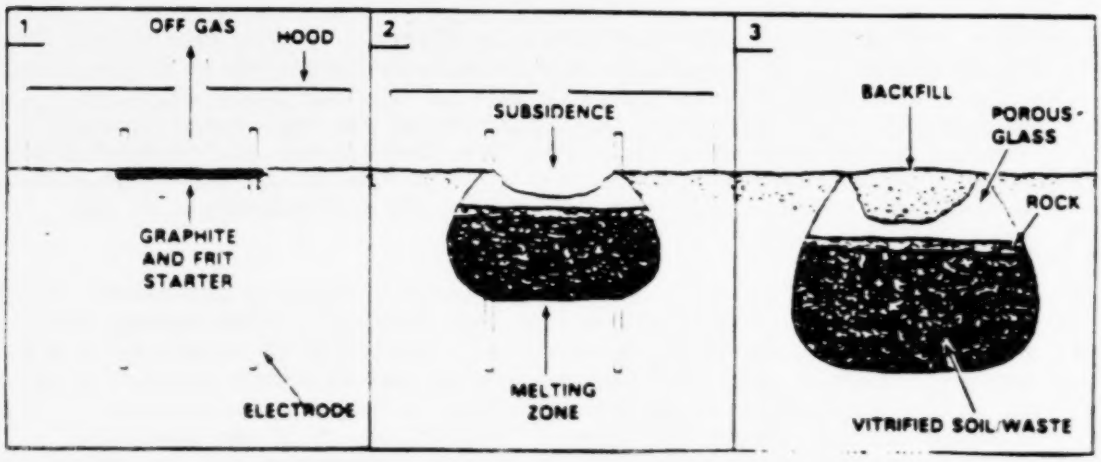
Alternative 1A is a permanent remedy requiring no maintenance of the vitrified mass to maintain effectiveness, and little overall maintenance. Alternative 1A is fully protective of human health and the environment, reduces mobility, toxicity, and volume of hazardous substances at the Pristine, Inc. site through treatment, and is a cost effective alternative. Therefore, Alternative 1A is the recommended alternative for the Pristine, Inc. site. Figure 9 is a depiction of the ISV process.

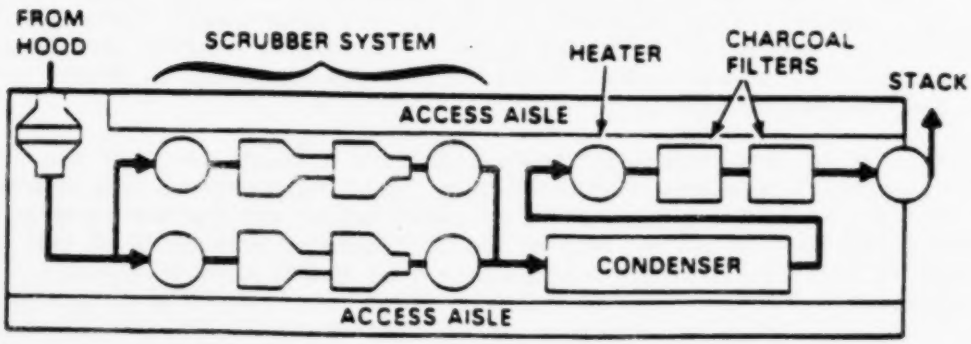
The Community and PRPs are generally in agreement with the groundwater

26a

FIGURE 9







OFF-GAS TRAILER

extraction and treatment component of the alternative.

There is community concern over the short-term effects of the alternative. Some members of the community have fully supported U.S. EPA's recommended alternative, while the PRPs rejected vitrification and have proposed installation of a RCRA cap with soil gas venting. The City of Reading prefers that U.S. EPA fund a less expensive remedial action and give it the remaining funds to build a new treatment plant. These concerns are addressed in the Responsiveness Summary.

Alternative 1A provides a high degree of treatment of the hazardous substances present at the site. It will be both a source control (through remediation of soil) and a management of migration remedy (through groundwater remediation). Therefore, the alternative will eliminate the threat of direct contact with hazardous substances, and the future threat of leachate production from the contaminated soil/residuals. The groundwater plume at the site has not been fully characterized in the lower aquifer. Although contaminated groundwater beneath the site will be extracted (lower outwash lens and upper 25 feet of lower aquifer) to control further contaminant migration, the extent of contamination in the lower aquifer due to the Prestine, Inc. site is not known. There is a potential multi-source groundwater contamination problem in the vicinity of the site. The extent of contamination from Pristine, Inc. will be determined by additional studies during the remedial design. This remedial action, however, is considered the final source control remedial action at the site.

Hazardous substances in the soil will be vitrified to permanently and significantly reduce their toxicity, mobility and volume. The organic compounds will be destroyed and the inorganic compounds will be permanently encapsulated.

Because this is not a proven technology, prior to implementation of this remedial action, bench and/or engineering pilot scale sudies will be required to confirm the effectiveness and applicability of this technology to site conditions. Because of concern over the effectiveness of vitrifying the upper outwash lens, consideration will be given, during these bench and/or pilot studies, to whether the lens should be drained prior to vitrification. A comprehensive program of testing and analysis on the vitrified material will be conducted after the material cools completely (cooling is expected to take three to five months). The Toxicity Characteristic Leaching Procedure (TCLP) is the testing mechanism that should be used to verify the complete treatment. If this treatment method is found to be ineffective, this Record of Decision may need to be reopened.

Monitoring will be conducted during the treatment process to determine if contamination is migrating through the soil as a result of the treatment.

Consistency with Other Laws

Alternative 1A is designed to meet all applicable, or relevant and appropriate requirements (ARARs) of Federal and State statutes. The Federal ARARs include RCRA (40 CFR Part 260-271), OSHA (29 CFR Part 1910)

The Safe Drinking Water Act (40 CFR Section 141.11 and .12), and the Clean Water Act (40 CFR Parts 122, 125 and 131). State ARARs include the Ohio Revised Code (ORC) Chapters 3704, 3734, 3745, 6109 and 6111. Rules for implementation of these requirements are contained the Ohio Administrative Code (OAC) 3745.

The following specific ARARs will be met by Alternative 1A.

Groundwater

Three groups of Federal standards and criteria are considered to be ARARs for groundwater at the Pristine, Inc. site; MCLs, RCRA Groundwater Protection Standards, and Water Quality Criteria.

MCLs - Maximum Contaminant Levels established under the Safe Drinking Water Act. These are the maximum contaminant concentrations allowed in regulated public water supplies. These levels apply at the tap to public water systems having at least 15 service connections or regularly serving at
least 25 individuals. Levels are based on a chemical's toxicity, treatability (including cost consideration), and analytical limits of detection. MCLs are ARARs since the lower aquifer is presently being used for drinking water and MCLs are the enforceable drinking water standard for public water supplies. Since MCLs apply to water at its point of distribution ("at the tap"), these levels are appropriate for groundwater at this site because wells that use the aquifer now, or residential wells in the future, generally have minimal or no treatment. Thus, these standards will have to be applied in the groundwater itself to ensure safe levels at the tap.

Safe Drinking Water Act (SDWA) - National Primary and Secondary Drinking Water Regulations established under 40 CFR Section 141.11 and 141.12 include MCLs which are ARARs for the Pristine, Inc. site.

RCRA Groundwater Protection Standards - RCRA Groundwater Protection Standards established under 40 CFR Section 264.94 include Background Concentrations, Table 1 values, and Alternate Concentration Limits (ACLs). These standards are specified in permits issued to hazardous waste management facilities pursuant to RCRA. Pristine, Inc. had interim status under RCRA. Therefore, these standards are ARARs. The following is a discussion of these standards.

1. Table 1 Values - 40 CFR Section 264.94(a)(2) lists maximum concentration limits (MCLs) for fourteen compounds. Three contaminants at the Pristine, Inc. site exceed these listed values: arsenic, barium, and lead. The levels are 50 ug/l for lead, 50 ug/l for arsenic, and 1,000 ug/l for barium. These levels are based on the Safe Drinking Water Act MCL, which is set at a level protective of human health and the environment.

2. Alternate Concentration Limits (ACLs) - EPA may establish ACLs in lieu of background levels or listed Table 1 values if the ACL "will not pose a substantial present or potential hazard to human health or the environment as long as the [ACL] is not exceeded." 40 CFR [264.94(b).

Section 121(d)(2)(B)(ii) of CERCLA restricts the use of ACLs as cleanup standards for on-site cleanups that assume a point of human exposure beyond the facility's boundary. The selected remedy for the Pristine, Inc. site does not assume a point of human exposure to contaminants exceeding ACLs beyond the facility boundary; rather, the point of human exposure includes the entire groundwater plume at, and migrating from, the facility. Therefore, the restriction given at Section 121(d)(2)(B)(ii) does not apply at this site. ACLs may be used to establish groundwater cleanup levels for the Pristine, Inc. site except for those contaminants listed in Table 1.

When the overall health based cleanup standard of 1×10^{-6} cumulative excess cancer risk at the plume boundary is met, by definition the concentrations of the individual contaminants in the groundwater will not present a threat to human health and environment. Those safe, residual concentrations which result in an overall health based cleanup level of 1×10^{-6} cumulative excess cancer risk at the site boundary will be the ACLs.

3. Background Levels - RCRA groundwater protection regulations require that the concentration of a hazardous constituent must not exceed background or the listed maximum concentration limit or the ACL. The listed Table 1 values for barium, lead and arsenic must be met at the site. ACLs for other contaminants will be health based levels. Background levels are ARARs when the concentrations of contaminants in the background exceed Table 1 values, ACLs or when the constituent has no health-based level.

Water Quality Criteria (WQC) Established Under the Clean Water Act

Although the Clean Water Act (CWA) is not legally "applicable" to the groundwater cleanup at the site, it is relevant and appropriate. Section 121(d)(2)(A)(ii) states that remedial actions shall attain water quality criteria established under Section 304 or 303 of the CWA, where such goals or criteria are relevant and appropriate under the circumstances of the release or threatened release.

The aquifers beneath the site are current and potential sources of drinking water. Therefore, WQC that have been adapted for drinking water only are ARARs for the groundwater cleanup for the site.

SOIL

The contaminated soil in the magic pit area and the sediments will be consolidated onsite. This alternative does not involve placement of soil. The treatment method will be carried out "in situ". Therefore, 40 CFR Part 268, the Land Disposal Restriction (LDR) does not apply. Subpart D, treatment standards, will be considered. The relevant and appropriate requirements of RCRA Subtitle C (Clean Closure and Landfill closure) regulations will be met by the selected remedy. The selected remedy involves in-situ treatment of contaminated soil and sediment and groundwater extraction and treatment at the site. Since in-situ treatment will occur entirely within the area of contamination, disposal will not occur as part of the selected remedy. Thus, RCRA closure requirements for

clean closure and landfill closure are relevant and appropriate. This allows implementation of closure that meets the relevant and appropriate requirements of RCRA clean closure/landfill closure.

A demonstration, involving groundwater or vadose zone monitoring, will be made to ensure that the treated material and untrated residuals will not migrate to the groundwater aquifer. A soil/vegetative cover will be placed over the surface of the site to address any potential direct contact threat. If the treatment method is effective to the point that the material left in place meets the criteria for delisting or the standards for risk-based closure, no RCRA-type cap is required. However, if sampling demonstrates that these criteria are not met, a RCRA-type cap may be required. It is assumed at this time that no RCRA-type cap will be required.

Other

o Part 264.90-101. Compliance monitoring and corrective action will be followed since hazardous waste has been released from the site. Groundwater collection and treatment will occur onsite prior to discharge. MCLs and ACLs will be used as minimum groundwater quality requirements, except if background levels exceed these other values or no health based ACLs, MCLs or other ARARs exist.

o Part 264.114 - All contaminated equipment, soils and structures must be properly disposed of or decontaminated. This would include excavation equipment, sampling equipment, and tanks.

o Part 264.116 - A survey plat indicating the location and dimensions of the hazardous waste closure area will be submitted to the local zoning authority, or the authority with jurisdiction over land use. The plat will also be submitted to the U.S. EPA Regional Administrator and the Director of the Ohio EPA.

o Part 264.14 and 264.117(b) and (c) - A 24-hour surveillance of the site will be maintained during closure activities to prevent unauthorized access. The use of the facility area must be restricted so that the monitoring system is not disturbed.

o RCRA Subchapter III, 42 U.S.C. 6921-6939b provides that U.S. EPA may require corrective action necessary to protect human health or the environment whenever U.S. EPA determines there has been a release of hazardous waste from a hazardous waste management facility.

Health and Safety

o The remedial action contractor must develop and implement a health and safety program for his workers. All onsite workers must meet the minimum training and medical monitoring requirements outlined in 40 CFR 1980.

Surface Water

o The treated groundwater discharged to the Mill Creek will meet the technical requirements of Section 402 of the CWA, the National Pollution Discharge Elimination System (NPDES) requirements. Specific chemical discharge limits will be developed for the groundwater treatment system that will ensure protection of water quality and aquatic life in the Mill Creek. Mill Creek is classified as a limited warmwater habitat.

The range of inorganic contaminants found in the groundwater and surface water exceeds Federal acute and/or chronic water quality criteria (e.g., cadmium, copper, lead, mercury, and zinc). Ohio water quality standards are also exceeded (e.g., cadmium, fluoride, lead and mercury). Ohio EPA will determine limits on all parameters for effluent discharges from the treatment facility based on Mill Creek's designated use and the appropriate State Standards. Some further treatment prior to or after the air stripper may be required. A bench scale study will be conducted to determine the need for metals treatment.

Air

o There are no ARARs directly derived from the Clean Air Act (CAA). However, the risk from inhalation of contaminants from either the present site conditions or as a result of remedial action leads U.S. EPA to take migitative action i.e., add granular activated carbon to the air stream, sample for radon gas or its decay products and treat the vitrified off-gases.

Naturally occurring and accelerator produced radioactive materials (NARM) are not covered by the Nuclear Regulatory Commission but by State agencies. The Ohio Department of Health has juridiction in this case.

Ohio Revised Code

ORC Chapter 3734 provides statutory authority for the regulations of solid and hazardous waste activities in the State of Ohio. As such, this chapter as a whole can be applied to any remedial action as a State ARAR.

The Ohio EPA hazardous waste regulations developed on the basis of Chapter 3734 of the ORC can be found in Section 3745-50 to 3745-69 of the Ohio Administrative Code. These regulations closely track U.S. EPA hazardous waste regulation with few exceptions.

ORC Chapter 3704 establishes Ohio EPA's authority to regulate and control air pollution within the State of Ohio. The rules developed and promulgated by Ohio EPA to implement the authorities granted through this law can be found in Sections 3745-15 to 3745-25 of the Ohio Administrative Code.

ORC Chapter 6111 establishes Ohio EPA's authority to set water quality standards (Section 611.04) and regulate water pollution sources. The rules developed and implemented by Ohio EPA based on Chapter 6111 ORC are contained in OAC Section 3745-1 through 3745-13.

ORC Chapter 6109 establishes Ohio EPA's authority to regulate public water supplies. The rules developed and implemented by Ohio EPA based on Chapter 6109 are contained in OAC Sections 3746-81 to 3745-99.

The alternative will meet the technical requirements of ORC Chapter 3734 since these regulations are essentially the same as RCRA with the exception of 3734.02(H), .05(c)(6), and 3745.53.11.

The air stripper will meet the requirements of ORC Chapter 3704. The vitrification off-gases will also meet these requirements.

The State of Ohio, as an authorized state, manages the NPDES program pursuant to the CWA. The technical requirements of the State NPDES program will be followed.

All State ARARs will be met through the implementaion of Alternative 1A.

Table 9 shows the cleanup levels that will be met. (The 10^{-6} values are not listed but may be used to develop the ACLs.) A cumulative list of ARARs is contained in Chapter 5 of the FS.

Summary Discussion

Considering the various evaluation factors found in SARA Section 121(b)(1) and the National Contingency Plan, Alternative 1A offers a cost-effective solution to the contamination problem at the site. The principal threats posed by the site are direct contact with on and off-site soils and ingestion of groundwater. In order to remedy these threats, Alternative 1A uses treatment as a principal element to the maximum extent practicable. It reduces the mobility, toxicity and volume of contaminants. In-situ vitrification of soils will eliminate the possibility for contaminants to leach into groundwater. Groundwater contaminants (both on- and off-site) will be removed and treated. This alternative provides equal protection as Alternative 2A and is approximately two times less expensive. The cost is comparable to off-site disposal costs.

Based on the above analysis and the earlier discussions, the recommended alternative is fully protective of public health and the environment, cost-effective, utilizes treatment technologies to the maximum extent practicable, and will attain all applicable, or relevant and appropriate Federal and State requirements. According to Section 121(b)(2), an alternative remedial action may be selected whether or not such action has been achieved in practice at any other facility or site that has similar characteristics. The present worth cost of Alternative 1A is $21,731,000 and the annual O&M cost is $94,800.

Table 9

ARARs
(ug/l)

Chemical	MCL(RCRA)	MCL(SDWA)	CWA WQC(drinking only)
aldrin			0.0012
arsenic	50	50	
barium	1000	1000	
benzene		5	
benzo(a)pyrene			0.0031
beryllium			0.0039
cadmium	10	10	10
chlorobenzene			488
chloroform (trihalomethanes)		100	
chromium	50	50	
copper		1,000	1,000
DDT			0.0012
dibutyl phthalate			
1,2-dichlorobenzene		75	
1,2-dichloroethane		5	
1,1-dichloroethene		7	0.00033
dieldrin			0.0011
ethylbenzene			2,400
fluoride		4000	
hexachloroethane			
lead	50	50	5,200
mercury	2	2	10
pentachlorophenol			1,010
phenol			3,500
2,3,7,8 TCDD			(0)
tetrachloroethene			0.88
toluene			15,000
1,1,1 trichloroethane		200	
trichloroethene		5	2.8
vinyl chloride		2	

OPERATION AND MAINTENANCE

The recommended alternative requires some annual Operation and Maintenance (O&M) activity to ensure that groundwater will be extracted and treated to meet ARARs. After the in-situ soil vitrification is completed, the treatment facility built, and the extraction system constructed, several O&M activities must be performed. Unsaturated zone monitoring must be conducted to determine whether hazardous constituents migrate out of the treatment zone. The vegetative cover must be maintained and be capable of maintaining growth without extensive maintenance. A run-on and run-off control system must be maintained. Onsite groundwater extraction and treatment will be required for at least five years or until cleanup levels are met in the groundwater under, and migrating from, the site. The groundwater will be monitored. A fence around the site must be maintained.

SCHEDULE

This remedial action start is one of the 175 sites comprising a statutory goal for remedial action starts by October 1989. The following are the key milestones for implementation of the remedial action in the event that RD/RA negotiations are not successful.

Milestone	Date
Approve Remedial Action (Sign ROD)	December 1987
Initiate Remedial Design/Pilot Studies	April 1988
Complete Remedial Design	June 1989
Initiate Remedial Action (Award Contract)	August 1989
Complete Remedial Action	August 1991

FUTURE ACTIONS

Additional studies will be conducted to determine the extent of the contaminant plume in the lower aquifer from the Pristine, Inc. site. It is suspected that there is a multi source groundwater contamination problem in the area. Because the problem is widespread, it may be addressed under additional mechanisms such as new NPL listings, RCRA corrective action, or Preliminary Assessment/Site Inspection (PA/SI) activity.

The extent of remediation of the contaminated soil necessary to protect human health and the environment has been defined based on actual analytical results obtained during the RI and RI-2, and on modeling conducted as part of the FS. In order to assure that an adequate cleanup will be done at the site, confirmational testing will be done on the soil which is vitrified as part of the bench and/or pilot scale studies.

Additionally, leachate tests may be conducted to confirm the expected leachate production capacity of the contaminated soils. This may be done in order to confirm these cleanup levels based on leachate production which were defined in the FS, and the resulting volume of soil that needs to be vitrified to meet these cleanup levels.

ADMINISTRATIVE RECORDS

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7	GENERAL CORRESPONDENCE	CONCERN OF CITY OF READING'S PLAN TO DEVELOP AN ADDITIONAL DRINKING WATER WELL ADJACENT TO PRISTINE SITE	JOSEPH DUFFICY	5/13/87	1
8	GENERAL CORRESPONDENCE	O.E.P.A. EVALUATION OF SURVEY CONDUCTED ON THE CITY OF READING WATER SUPPLY	REX BROWN	9/9/85	7
9	GENERAL CORRESPONDENCE	FORMAL SUBMITTAL PRESENTING THE RESULTS OF BOTH SAMPLING EVENTS IN TABULAR FORMAT, AND RECOMMENDATIONS FROM U.S.E.P.A. & C.D.C. REGARDING THE SAFETY OF WATER CONSUMPTION	MARY TYSON	2/7/86	20
10	GENERAL CORRESPONDENCE	LETTER TO PRESIDENT REAGAN, CONCERNING WASTEFUL GOVERNMENT SPENDING AT PRISTINE SITE, READING, OHIO	RILEY N. KINMAN	3/7/85	1
11	GENERAL CORRESPONDENCE	RESPONSE TO RILEY N. KINMAN'S LETTER TO PRESIDENT REAGAN	VLADAS V. ADAMKUS	4/12/85	2
12	GENERAL CORRESPONDENCE	MEMORANDUM: HEALTH ASSESSMENT	STEPHEN MARGOLIS	11/5/85	4
13	GENERAL CORRESPONDENCE	CLARIFICATION OF ISSUES RAISED REGARDING THE EARLIER STUDIES ON THE RI/FS AT PRISTINE SITE	MARY TYSON	4/12/85	2
14	GENERAL CORRESPONDENCE	SUBMITTAL OF STATEMENT OF WORK TO O.EPA AND REQUEST TO RESPOND TO AN AGREEMENT OF RI/FS	MARY TYSON	3/29/84	1
15	GENERAL CORRESPONDENCE	NOTIFICATION OF PROPOSED SUPERFUND PROJECT	BASIL CONSTANTELOS	5/15/84	3

*** Total ***

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ADMINISTRATIVE RECORDS

PRISTINE, INC., READING, OHIO
GUIDANCE DOCUMENTS USED

TITLE	AUTHOR	DATE
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INDEX TO DUCUMENTS REGARDING PUBLIC AFFAIRS

REC.	TITLE	DESCRIPTION	AUTHOR	DATE	PAGES
1	PUBLIC AFFAIRS	U.S.EPA ORDERS SURFACE CLEAN UP BY PRISTINE, INC.	MARY TYSON	3/20/84	1
2	PUBLIC AFFAIRS	FACT SHEET: PRISTINE, INC. SITE	U.S.E.P.A. REG. V	3/85	4
3	PUBLIC AFFAIRS	PUBLIC MEETING: READING, OHIO, AGENEDA	U.S.E.P.A. REG.V	3/6/85	1
4	PUBLIC AFFAIRS	DISCUSSION OF PUBLIC MEETING - MARCH 6, 1985	MARGARET McCUE	3/26/85	1
5	PUBLIC AFFAIRS	OFFICIAL NEWS RELEASE TO BRIEF RESIDENTES ON PRISTINE, INC. SITE	MARY TYSON	2/21/85	1
6	PUBLIC AFFAIRS	COVER LETTER FOR FACT SHEET - TO PERSONS INTERESTED IN PRISTINE	MARY TYSON	9/23/86	1
7	PUBLIC AFFAIRS	FACT SHEET: SUPERFUND PROGRAM REMEDIAL INVESTIGATION UPDATE	U.S.E.P.A.	7/86	4
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					0
*** Total ***					13

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INDEX TO THE PLEADINGS FILE

TITLE	AUTHOR	DATE
		-
DEPARTMENT OF JUSTICE TRANSMITTAL TO U.S. ATTORNEY	(DOJ)	3/6/87
U.S. vs. LONGS - COMPLAINT	U.S. ATTORNEY - SOUTHERN DISTRICT OF OHIO	3/12/87
U.S. vs. LONG - MEMO IN SUPPORT OF IMMEDIATE ORDER IN AID OF ACCESS	U.S. ATTORNEY	5/7/87
U.S vs. LONGS - COURT ORDER GRANTING ACCESS	U.S. ATTORNEY	5/12/87

Administrative Record Index (Continued)

CERCLA as Amended by SARA

National Oil and Hazardous Substances Contingency Plan (NCP), 40 CFR Part 300

Letter from Lee M. Thomas to Honorable James J. Florio dated May 21, 1987

Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements by J. Winston Porter dated July 9, 1987

Hazardous Waste Management System; Land Disposal Restrictions; Final Rule 40 CFR Part 260 et al., Friday, November 7, 1987

Letter from Mary Tyson to Donald Sullivan dated November 25, 1987, with attachment

"In Situ Vitrification of Transuranic Waste: An Updated System Evaluation and Applications Assessment". Battelle, March 1987

June 25, 1987 - Letter from Pristine Group (Jernigan) to U.S. EPA (Conway)

July 9, 1987 - Letter from Pristine Group (Sullivan) to U.S. EPA (Dufficy, Tyson, Conway)

August 7, 1987 - Letter from Pristine PRP Group (Sullivan) to U.S. EPA (Tyson)

August 11, 1987 - Letter from U.S. EPA (Conway) to Pristine Group (Sullivan)

August 13, 1987 - Letter from U.S. EPA (Conway) to Pristine Group (Jernigan)

September 17, 1987 - Memorandum from Weston (Rae Mindock) to U.S. EPA (Tyson)

October 19, 1987 - FOIA request from Dames and Moore (Fred Erdmann) to U.S. EPA (Robert Hartian)

October 28, 1987 - Letter from Pristine Group (Sullivan) to U.S. EPA (Conway)

November 6, 1987 - Letter from Pristine Group (Sullivan) to U.S. EPA (Conway), with attachment

November 9, 1987 - Letter from Weston (Mindock) to Dames and Moore (Erdmann)

November 18, 1987 - FOIA response from U.S. EPA (Mary Gade) to Dames and Moore (Erdmann)

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December 9, 1987 - Letter from U.S. EPA (Conway) to Pristine Group (Sullivan)

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Public Comment Draft Feasibility Study, Pristine, Inc., November 12, 1987

Addendum to the Remedial Investigation, Pristine, Inc., December 28, 1987

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
PRISTINE, INC.
READING, OHIO

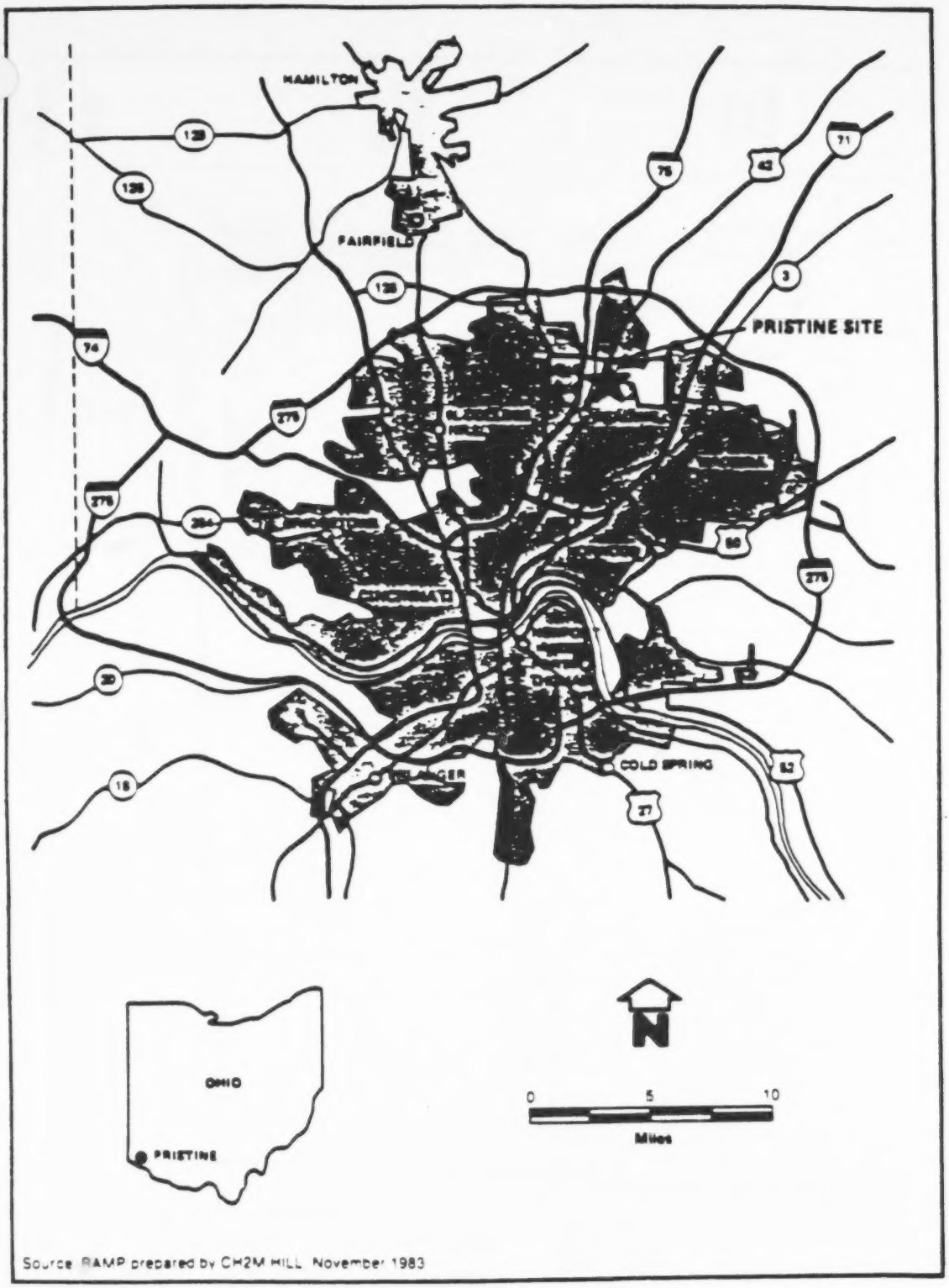
SITE LOCATION AND DESCRIPTION

The Pristine, Inc. site is located in southwestern Ohio in the City of Reading (population 12,843), a suburb of Cincinnati. The site occupies approximately two acres in the northeast quarter of Section 33, Township 4, Range 1 in Hamilton County, Ohio (Figure 1). The site is bordered by residential and industrial areas (Figure 2). Cincinnati Drum Service, directly west of the site, cleans, reclaims, and recycles steel drums. Carstab Corporation, directly south of the site, manufactures synthetic stabilizers and plasticizers. The immediate eastern limit of the site is bordered by Conrail Railroad right-of-way. Three hundred feet northeast of the site, beyond the railroad, is a residential trailer park. The land to the north is owned by the City of Reading. Eight municipal water supply wells serving the citizens of Reading are located approximately 300 feet northwest of the site.

Mill Creek flows from north to south approximately 600 feet west of the site. The creek is not used as a drinking water source or for recreational purposes although intermittent fishing in the creek has been observed. It discharges to the Ohio River 14 miles downstream. The average yearly precipitation is approximately 40 inches. Approximately six inches is accounted for by recharge to groundwater flow systems.

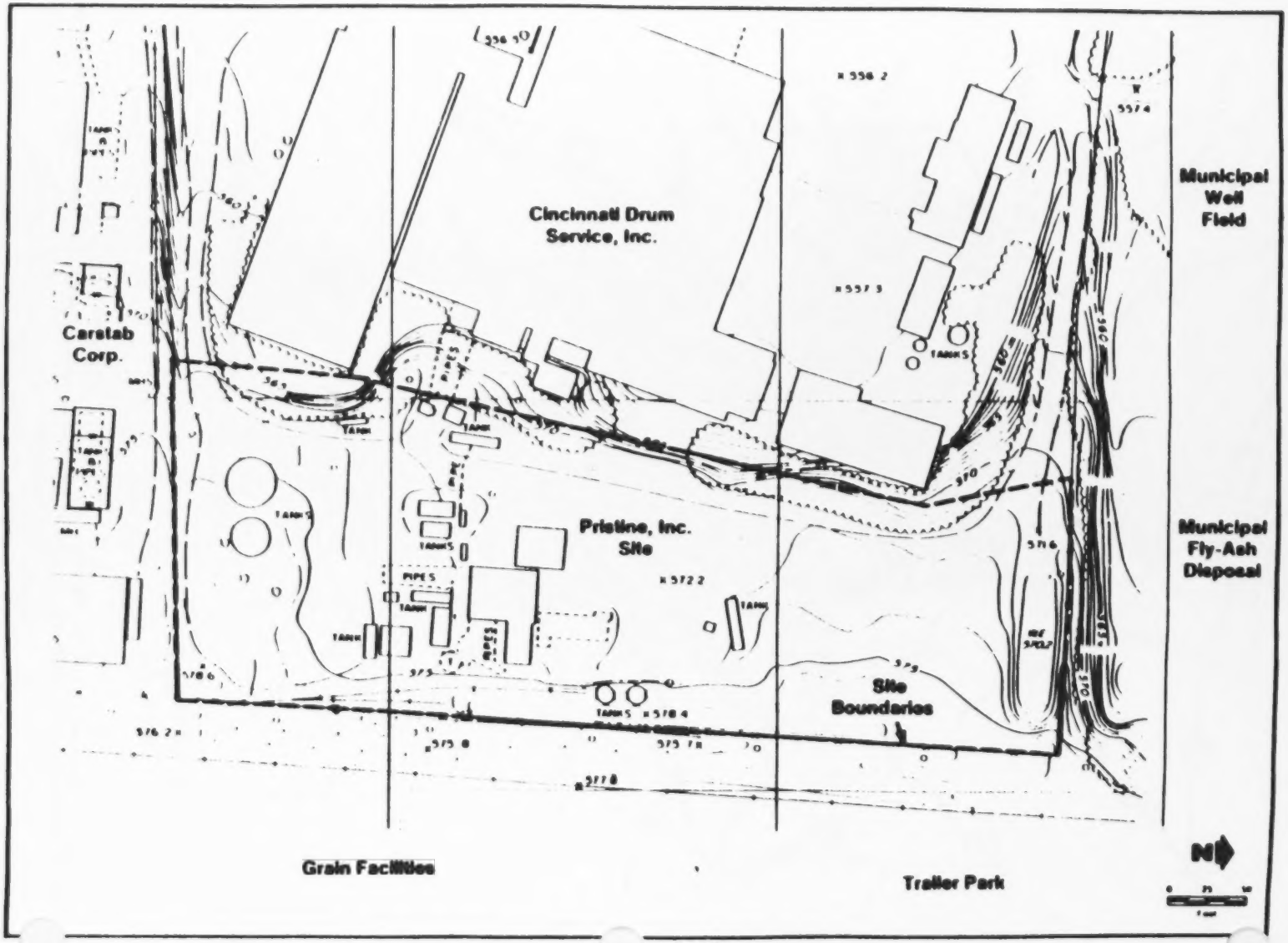
The Pristine, Inc. site is situated over the buried valley of the Deep Stage Cincinnati River, a glacial-aged river fed by meltwater that eroded several hundred feet into shale and limestone bedrock. Outwash and other glacially derived sediments, which are about 180 feet thick in the vicinity of the site, were subsequently deposited in this valley. The Pristine, Inc. site is situated on a low terrace that is about ten feet higher than the floodplain of Mill Creek, which now drains the valley. The edge of this terrace is marked by an escarpment which coincides with the western border of the site. The Pristine, Inc. site is not located within the 100 year flood plain, or in a wetlands area.

The site geology consists of five distinct soil units (Figure 3), fill, upper lake sediment glacial till, lower lake sediment, and lower outwash deposits. There are two aquifers under the site. The upper aquifer lies within the upper lake sediments and the lower aquifer lies within the lower outwash deposits. Within the upper lake sediments, there are three lenses that are interconnected; the upper, middle, and lower lenses. The upper aquifer consists of three perched water systems flowing within the lenses in different directions moving downward through the till to the lower aquifer (Figure 4). At the eastern edge of the site, the upper aquifer system lies directly on top of the lower aquifer.



Source: RAMP prepared by CH2M HILL November 1983

FIGURE 1
SITE LOCATION MAP
PRISTINE, INC. SITE


Cincinnati Drum Service, Inc.
Carstab Corp.
Pristine, Inc. Site
Site Boundaries
Municipal Well Field
Municipal Fly-Ash Disposal
Grain Facilities
Trailer Park
N

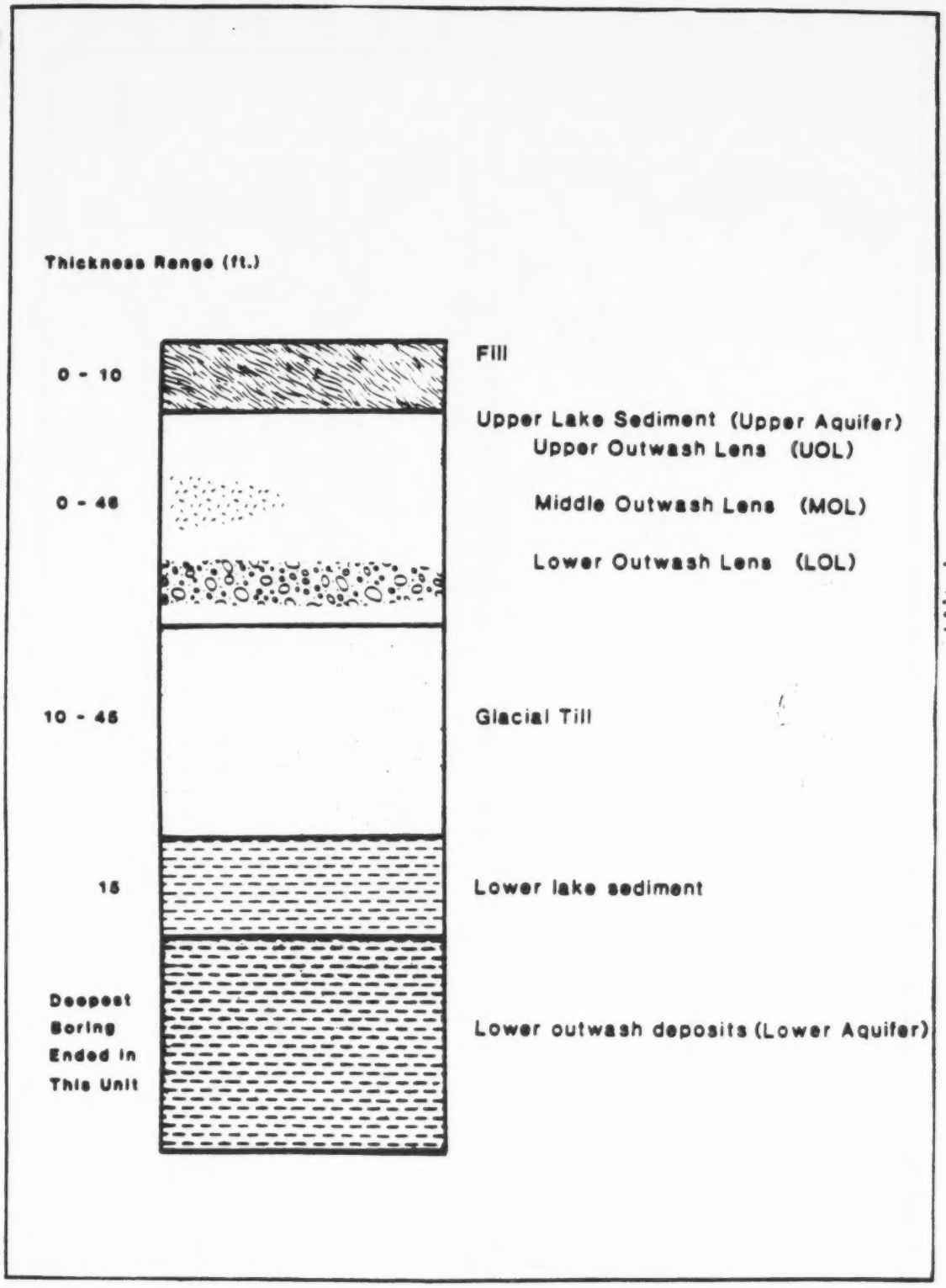


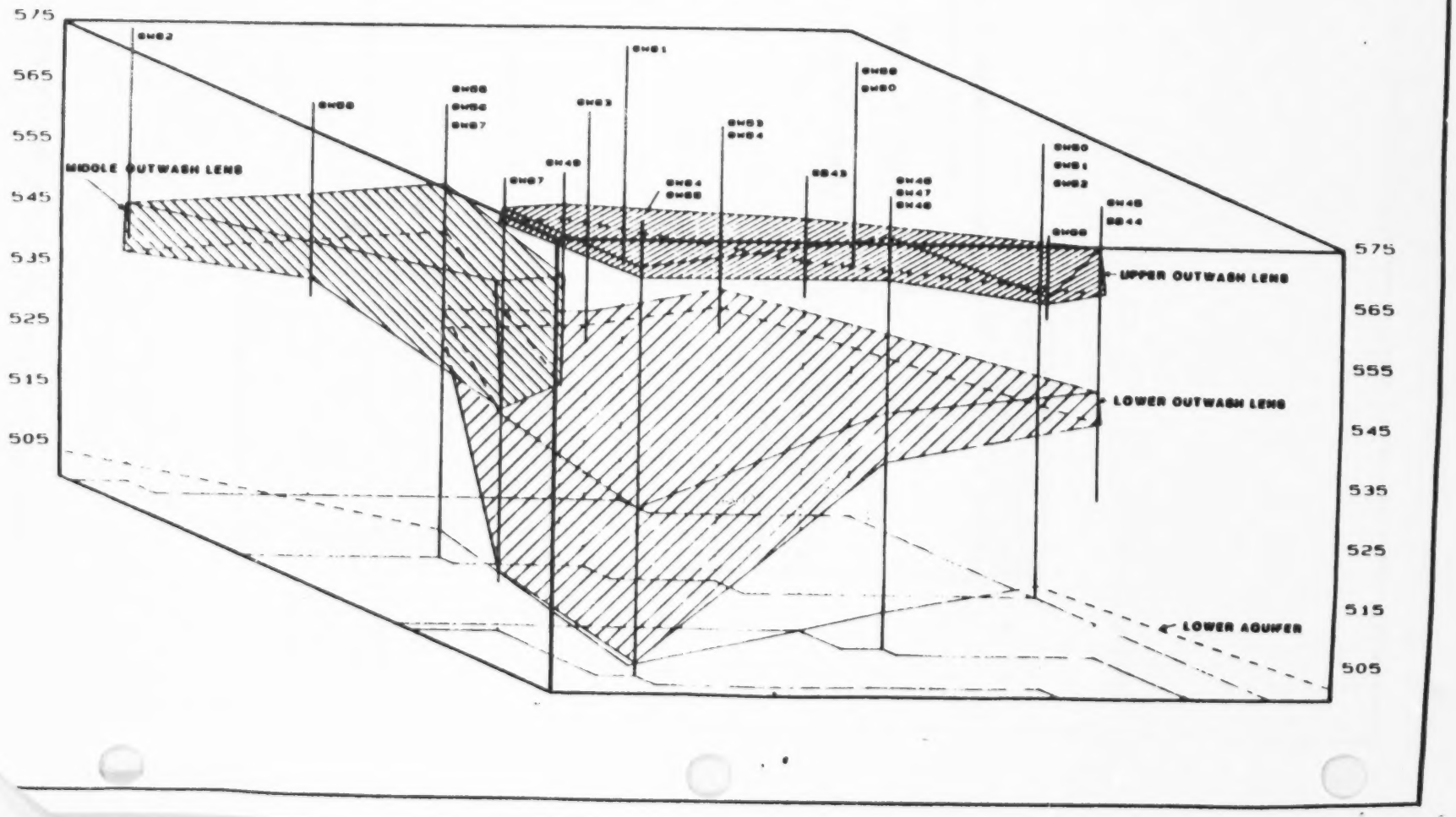
FIGURE 3

GENERALIZED COLUMN UNDER THE PRISTINE, INC. SITE

FIGURE 4

CONFIGURATION of UPPER AQUIFER in RELATION to LOWER AQUIFER

PRISTINE INC. SITE



DECLARATION FOR THE RECORD OF DECISION

PRISTINE, INC. SITE
READING, OHIO

PURPOSE

This decision document represents the selected remedial action for the Pristine, Inc. site in Reading, Ohio. It was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Contingency Plan (40 CFR Part 300).

The State of Ohio has been consulted on the selected remedy and has indicated that a letter of concurrence is forthcoming.

BASIS

The selection of remedy is based upon the Pristine, Inc. Site Administrative Record. The attached index identifies the items which comprise this record.

DESCRIPTION OF SELECTED REMEDY

This final source control remedial action consists of the following:

Excavation and onsite consolidation of 1,725 cubic yards of sediment and soil;

In-situ vitrification to an average depth of ten feet across the site;

Installation of a french drain along the eastern site boundary;

Extraction of groundwater from the lower outwash lens/lower aquifer using at least one extraction well;

On-site treatment of groundwater using air stripper with discharge to Mill Creek;

Decontamination of structures followed by removal and disposal at a solid waste landfill; and

Access and deed restrictions, and groundwater monitoring.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. As mandated by CERCLA as amended by SARA, the remedy satisfies the preference for treatment that reduces toxicity, mobility, or volume as a principal element. Finally, I have determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

12/31/87
Date

Valdas V. Adamkus
Regional Administrator
U.S. EPA, Region V